## DOCUMENT RESUME

| | |
|---|---|
| ED 212 847 | CE 031 374 |

| | |
|---|---|
| AUTHOR | Wiley, David E.; Harnischfeger, Annegret |
| TITLE | High School Learning, Vocational Tracking, and What Then? Contractor Report. |
| INSTITUTION | CEMREL, Inc., Chicago, Ill. ML-GROUP for Policy Studies in Education. |
| SPONS AGENCY | National Center for Education Statistics (ED), Washington, D.C. |
| REPORT NO | NCES-82-214 |
| PUB DATE | Jul 80 |
| CONTRACT | 300-78-0546 |
| NOTE | 199p. |
| EDRS PRICE | MF01/PC08 Plus Postage. |
| DESCRIPTORS | Academic Achievement; Comparative Analysis; Educational Attainment; *Education Work Relationship; Employment Patterns; Family Status; Followup Studies; *High Schools; *High School Seniors; Life Style; Longitudinal Studies; Military Service; National Surveys; *Outcomes of Education; *Participation; Postsecondary Education; Racial Factors; Resource Allocation; Salary Wage Differentials; Sex; Student Attitudes; Student Educational Objectives; *Vocational Education; Work Experience |

ABSTRACT

The National Longitudinal Study of the High School Class of 1972 collected data on the backgrounds, experiences, attitudes, and plans of 16,683 students who were high school seniors at 1,044 schools in 1972. In addition, three followup studies focused on the work experiences, education and training, military service, family status, life experiences, and opinions of these respondents as of 1973, 1974, and 1976. After analyzing those data from the survey pertaining to vocational education, researchers arrived at a number of conclusions. Included among these were the following: (1) race, sex, and academic performance are key factors for selection of vocational education programs, with minority students, poor achievers, and females being the most frequent enrollees in vocational education; (2) because vocational education funds are allocated by local enrollment and program costs rather than by program enrollment, vocational education resources and services are diffused far beyond those enrolled in vocational education; (3) those in vocational programs work 40 percent more than do those in non-vocational programs; (4) far fewer vocational-track students receive postsecondary schooling than do academic-track students; and (5) high school coursework and work hours related strongly post-secondary work hours and wage rates. (MN)

***********************************************************************
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
***********************************************************************

CE

ED212847

# Contractor Report

## High School Learning, Vocational Tracking, and What Then?

National Center for
Education Statistics

CE031374

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

# High School Learning, Vocational Tracking, and What Then?

CEMREL, Inc.

David E. Wiley
Northwestern University
Annegret Harnischfeger
CEMREL, Inc.

Andrew J. Kolstad
Project Officer
National Center for Education Statistics

July 1980

Prepared for the National Center for Education Statistics under contract OE-300-78-0546 with the U.S. Department of Education. Contractors undertaking such projects are encouraged to express freely their professional judgment. This report, therefore, does not necessarily represent positions on policies of the Government, and no official endorsement should be inferred. This report is released as received from the contractor.

NCES 82-214

## Highlights

1. Vocational Programs and Courses. Vocational programs are offered in 58 percent of all secondary schools,and 90 percent of all high school seniors are enrolled in these schools. However, 99 percent of all seniors are in schools which offer vocational courses. 77 percent of all female seniors who are in vocational programs focus on "business" and 70 percent vocational track males are enrolled in Trades or Industrial programs.

2. Selection into Vocational Education. Race and academic performance are the key selection factors for vocational education. Within racial groups and especially for males, the lowest achieving pupils enter vocational programs. However, as academic achievement among black pupils is substantially lower than that for whites, academic track blacks achieve at about the same level as whites in general or vocational programs; and blacks in vocational curricula have far lower academic performance than their white program mates. Also, females, independent of achievement levels, participate more frequently in vocational programs.

3. Allocation of Vocational Education Resources and Services. In many states, federal as well as state vocational funds are allocated on the basis of local course enrollments or program costs, rather than program enrollments. Because of ambiguities in accounting -- both financial and enrollment -- and in local program decisions, vocational resources and services are diffused far beyond those enrolled in vocational programs. Consequently, fully 53 percent of all vocational education course hours are taken by pupils enrolled in academic or general programs.

4. Program Differences in Course Exposure and Work During High School. Over the last three years of high school, pupils in vocational programs devote 26 percent (6.1 hours per week) of their course work to vocational instruction, while pupils in academic curricula spend only 7 percent (1.5 hours per week) of their class time in this way. All together -- in academic as as well as vocational pursuits -- vocational pupils spend 10 percent more time in settings which yield course credit than academic pupils (23.7 hours per week versus 22.4). Independently of race and sex of pupil, those in vocational programs work 40 percent more (16½ hours per week) than those in academic curricula (11½ hours). However, there are also strong effects of race and sex on work hours: males work 40 percent more hours than females, whites work 36 percent more hours than blacks. And within all tracks, the more pupils work, the less academic coursework they take. Finally, high school program strongly determines which pupils meet course admission requirements to universities: less than one-half of one percent of vocational pupils satisfy Harvard's course entry requirements, while over ten percent of academic track pupils do so; 24 percent of vocational enrollees satisfy Purdue's requirements, 67 percent of academic pupils do so.

5. High School Program Differences in Post-Secondary Schooling. High school track or program strongly determines rates at which former secondary pupils are exposed to different types and amounts of additional schooling. Only 39 percent of vocational track pupils had taken any additional schooling by 1976, while 85 percent of academic program participants had done so. And at the extremes: 14 percent of vocational pupils and 69 percent of academic pupils were exposed to more than two years of academic training. Post-secondary vocational training of any type or duration was experienced by 22 percent of former vocational pupils and only 8½ percent of their former academic schoolmates. And, importantly, within tracks, race and sex made only small differences in type or amount of subsequent training. Thus, the well-known finding that blacks with the same measured abilities as whites go on to college at higher rates is easily explained as a tracking effect, because ability levels of blacks and whites in the same tracks are greatly discrepant.

6. High School Program Differences in Work Hours and Wage Rates. High school coursework and work hours relate strongly to post-secondary work hours and wage rates although the effects were only half as large in October, 1976, as in October, 1972. Generally, the more pupil's course and work experiences resembled those of one enrolled in a vocational program, the more hours he worked after high school and the higher his wage rate. However, once the actual high school program was taken into account, these effects were also reduced. By 1976 the effects of these course and work differences were, on average within track, negative for wage rates and only moderately positive for work hours. In fact, for those who had been in vocational programs, large increments in their vocational course work and high school employment increased work hours by only 5 percent (to well above 40 hours per week) and reduced their wage rates by over 2 percent. Large high school program effects remained after adjustment for high school work and course experiences, however: Academic pupils with experiences and abilities similar to those of vocational pupils worked less than these vocational pupils, but, their wage rates were close to parity. All of these effects and the changes in them between 1972 and 1976 strongly suggest that the advantages of high school work and vocational education are partially spurious. That is, they depend on the fact that pupils who enter post-secondary education forgo the accumulation of "credit" for their labor market experiences collatoral to and in between their schooling experiences. This enhances the apparent effects of high school work and vocational education, because these pupils more often do not participate at all in post-secondary education. Once the time period of usual post-secondary education is past, these differentials should disappear.

## Acknowledgments

The main participants in this study (other than the authors) were Edward Haertel, Elaine Hwang, and David Rindskopf. Mr. Rindskopf, who left the study for an academic position at the conclusion of the analysis phase, was project manager up to that time. His contributions were singularly important; without his managerial and scientific contributions, the study could not have been carried to this culmination. William Schmidt was co-principal investigator of this project. He contributed greatedly to the formulation of this study, especially facilitating the refinement of his earlier definitions of course exposure to those used in this project and his work in defining the College Entrance Course requirements for various universities (Appendix E). Most of his additional contributions, however, are incorporated into the companion report. Work assignments for all participants are outlined in the Preface.

We would also like to extend our great appreciation to Andrew Kolstad, our Project Officer at the National Center for Education Statistics. He was invariably responsive to our requests and the project would have been greatly impoverished without his strong support.

The work was performed under Contract Number 300-78-0546 of the National Center for Education Statistics, U.S. Department of Health, Education and Welfare. The opinions expressed in this report do not necessarily reflect the position, policy, or endorsement of the National Center for Education Statistics.

## Table of Contents

Preface . . . . . . . . . . i

1. Vocational Education: Curricula, Courses, and Resources . . . . . . 1
   1.1 What is Vocational Education . . . . . . 2
   1.2 Funding for Vocational Education . . . . . . 7

2. The High School Class of 1972: Social Composition and Program Participation . . . . . . 11
   2.1 The Basic Stratification: Sex and Racial/Ethnic Group . . . . 11
   2.2 The Social Background of High School Seniors . . . . . . 13
   2.3 The Social Composition of High School Programs . . . . . . 13
   2.4 Contextual Effects on High School Program Selection Processes . . . . . . 18

3. Occupational and Academic Programs: School Offerings and Pupil Experience . . . . . . 25
   3.1 Vocational Offerings: Programs and Courses . . . . . . 25
   3.2 Exposure to Instruction . . . . . . 31
   3.3 High School Work . . . . . . 42
   3.4 Work and Its Relation to Instruction . . . . . . 47
   3.5 Hours of Academic Instruction, Vocational Instruction, and Work: A Summary of Differences . . . . . . 57
   3.6 The Allocation of Instructional Resources: Vocational Education . . . . . . 60
   3.7 Academic Achievement and High School Programs . . . . . . 73
   3.8 College Entrance Course Requirements: An Integration of Instructional Experience . . . . . . 79

4. Post-Secondary Training and Labor Force Participation . . . . . . 82
   4.1 Patterns of Training and Work: 1972 to 1976 . . . . . . 82
   4.2 High School Programs and Their Relations to Post-Secondary Experiences . . . . . . 87
   4.3 High School Experience and Labor Market Outcomes . . . . . . 97
   4.4 High School Program and Labor Market Outcomes . . . . . . 109

5. Conclusion . . . . . . 117

References . . . . . . 130

Appendix A . . . . . . A1-A2

Appendix B . . . . . . B1-B7

Appendix C . . . . . . C1

Appendix D . . . . . . B1-B10

Appendix E . . . . . . E1-E2

## List of Tables and Figures

Tables

1.1 Secondary Occupational and Related Course and Program Enrollments: 1972/73. . . . . . . . . . . . . . . . . . . . . . . . 3

1.2 Estimated Number and Percent Distribution of Secondary-Level Vocational Education Enrollees, by Program Area, 1972/73. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 4

1.3 Vocational and Non-Vocational Course Enrollments in Vocational Courses, 1972/73. . . . . . . . . . . . . . . . . . . . . . 4

1.4 Total and Twelfth Grade Course Enrollments in Secondary Vocational Educations, 1972/73 . . . . . . . . . . . . . . . . . . . . 5

1.5 Twelfth Grade Program Enrollments (Spring 1972) and Twelfth Grade Course Enrollments (1972/73) in Vocational Education . . . . . 6

1.6 Expenditures for Vocational Education, by Source, 1968-1977. . . . . 7

1.7 Program Distribution of Federal Vocational Education Funds . . . . . . 8

1.8 Number of Secondary Schools with Occupational Curriculums by Type of School and Control: Aggregate United States, fall, 1971 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9

2.1 Estimated Population of High School Seniors in 1972 by Racial/Ethnic Group and Sex (1000s). . . . . . . . . . . . . . . . . . . . 11

2.2 Percentage Decomposition of Population of 1972 High School Seniors, by Racial/Ethnic Group and Sex. . . . . . . . . . . . . . . . . 11

2.3 Father's Educational Level by Racial/Ethnic Group. . . . . . . . . . . 13

2.4 High School Program Enrollment Distribution, by Race and Father's Education . . . . . . . . . . . . . . . . . . . . . . . . . 14

2.5 Percent by Which Black Enrollment Rates for High School Programs Exceed Those for Whites, by Father's Educational Level. . . . . . . . . . . . . . . . . . . . . . . . . . . . . 15

2.6 High School Program Enrollment Distribution, by Sex and Father's Education . . . . . . . . . . . . . . . . . . . . . . . . . 16

2.7 Percent by Which Female Enrollment Rates for High School Programs Exceed Those for Males, by Father's Educational Level. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 16

2.8 Race and Sex Composition of Vocational Program Enrollments. . . . . . 18

2.9 Race and Sex Composition of Academic Program Enrollments. . . . . . 18

3.1 Percentage of Pupils in Schools Offering Vocational Programs and Courses, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . 25

3.2 Percentage of Pupils in Schools Offering at Least One Course in a Vocational Area, by Area, Race and Sex . . . . . . . . . . . . . 26

3.3 Number of Vocational Areas Offered, by Race and Sex . . . . . . . . 27

3.4 Patterns of Vocational Education Course Offerings, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . 28

3.5 Percent of Pupils in Schools Offering Five or Six Vocational Areas, by School Size, Race and Sex . . . . . . . . . . . . . . . . 29

3.6 Percent of Pupils in Schools Offering Five or Six Vocational Areas, by Region, Race and Sex. . . . . . . . . . . . . . . . . . . 30

3.7 Percent of Pupils Taking at Least One Course in Various Academic Areas, by Race and Sex . . . . . . . . . . . . . . . . . 32

3.8 Average Hours of Instruction in Selected Academic Areas, Total and For Those Taking at Least One Course, by Race and Sex . . . . . 35

3.9 Discrepancy in Course Hours: Blacks and Females Compared to White Males, by High School Program . . . . . . . . . . . . . . . . 36

3.10 Discrepancy in Instructional Hours Between Vocational and Academic Programs as a Percent of Vocational Program Hours. . . . . 38

3.11 Hours Worked in High School, by Race and Sex. . . . . . . . . . . . 42

3.12 Mean Hours Worked in High School, by High School Program, Father's Education, Race and Sex. . . . . . . . . . . . . . . . . . . 43

3.13 Percent Participation in Federal Programs, by Race and Sex. . . . . 44

3.14 Mean Hours of High School Work, by Program Participation, for Each Race and Sex Group . . . . . . . . . . . . . . . . . . . . . 46

3.15 Hours of Instruction, by Curricular Area and Hours of Work for White Males . . . . . . . . . . . . . . . . . . . . . . . . . . 50

3.16 Estimated Mean Hours Per Week of Instruction in Foreign Language for Pupils Who Worked 30 Hours and for Pupils Who Did Not Work, by Race, Sex and High School Program. . . . . . . 53

3.17 Correlations Among Total Instructional Hours, Academic Instructional Hours, Vocational Instructional Hours and Work Hours, by Race, Sex, and High School Program . . . . . . . . . 55

3.18 Academic/Vocational Program Contrasts in Hours Per Week of Work, Academic and Vocational Training, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . 57

3.19 Mean Hours of Vocational Instruction, by Racial/Ethnic Group, Sex, and High School Program . . . . . . . . . . . . . . . . . 66

3.20 Percent Population Distribution, Over Racial/Ethnic, Sex, and High School Program Groups for Pupils with Complete Information on High School Programs and Course-Taking . . . . . . . . . . . . . . . . . . . . . . . . . 63

3.21 Percent of Vocational Instructional Resources Allocated to Various Racial/Ethnic, Sex and High School Program Groups. . . . . . . . . . . . . . . . . . . . . . . . . . . . . 64

3.22 Percent Discrepancy: Total Vocational Instructional Resources Allocated Versus Proportion of Pupils, by Racial/Ethnic, Sex and High School Program Group. . . . . . . . . . 66

3.23 Percent of Vocational Instructional Resources Allocated to Various Racial/Ethnic and Sex Groups, by High School Program . . . . . . . . . . . . . . . . . . . . . . . . . . . . 68

3.24 Percent Population Distribution Over Racial/Ethnic and Sex Groups, by High School Programs . . . . . . . . . . . . . . . . . 69

3.25 Percent Discrepancy: Vocational Instructional Resources Allocated Versus Proportion of Pupils, by Racial/Ethnic and Sex Group, for Each High School Program . . . . . . . . . . . . 70

3.26 Means of Mathematics, Reading, and Vocabulary Test Scores, by Race, Sex, Father's Education, and High School Program . . . . . 74

3.27 Differences in Vocabulary Score Means Between High School Programs, Before and After Adjustment for Discrepancies in Hours of Academic and Vocational Instruction and Work, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . . 77

3.28 Rates at Which High School Students of Different Race and Sex Groups Met Course Requirements for Admission to Three Universities. . . . . . . . . . . . . . . . . . . . . . . . . . . 80

3.29 Rates of Satisfaction of Colleges Entrance Requirements, by Program, Race and Sex. . . . . . . . . . . . . . . . . . . . . . 81

4.1 Employment, Work Hours, and Earnings, 1972 to 1976, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . . 83

4.2 Unemployment Histories, 1972-1976, by Race and Sex . . . . . . . . . . 84

4.3 Education and Work Status (Percent): October, 1972, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . . 85

4.4 Percent of High School Class of 1972 With College Degree by 1976, by Race and Sex. . . . . . . . . . . . . . . . . . . . 86

4.5 Post-Secondary Education and Work History to 1976, by Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . . 87

4.6 High School Program Differences in Post-Secondary Experience . . . . . . . . . . . . . . . . . . . . . . . . . . . 88

4.7.1 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, White Males. . . . . . . . . . . . . . . . . . . . . . . . . . . . 89

4.7.2 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, White Females. . . . . . . . . . . . . . . . . . . . . . . . . . . 90

4.7.3 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, Black Males. . . . . . . . . . . . . . . . . . . . . . . . . . . . 91

4.7.4 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, Black Females. . . . . . . . . . . . . . . . . . . . . . . . . . . 92

4.8 Regression Coefficients for "No Training" by Program, Race and Sex . . . . . . . . . . . . . . . . . . . . . . . . . . . 96

4.9 Percent of Who Worked (1972, 1976) and Who Were Never Unemployed (1972-1976), by High School Program, Race and Sex. . . . . . . . . . . . . . . . . . . . . . . . . . . . . 98

4.10 Means of High School Experience Characteristics, Test Scores, and Labor Market Outcomes (1972 and 1976) for White Males by Work Pattern. . . . . . . . . . . . . . . . . . . . . 100

4.11 Parameter Estimates for Regressions of Labor Market Outcome Characteristics on High School Experiences Characteristics and Test Scores, for White Males, by Work Pattern. . . . . . . . . . . . . . . . . . . . . . . . . . 102

4.12 Percent Changes in Work Hours, Wage Rates and Wages Accompanying Modifications in High School Experience. . . . . . . . . 104

4.13 Labor Market Outcomes (1976) for White Males, by Post-Secondary Training Pattern . . . . . . . . . . . . . . . . . . . . 107

4.14 Regression Relations of High School Experience Characteristics to Labor Market Outcomes (1976) for White Males with Selected Post-Secondary Training Patterns . . . . . . . . . . . . . . . . . . . . . . . . 108

4.15 Mean 1976 Work Hours, Wage Rates, and Wages, by High School Program, Race, Sex, and Work Pattern. . . . . . . . . . . 110

4.16 Regression Coefficients Relating High School Course Exposure and Work Experience to Wages and Hours Worked in 1976, by High School Program, and Sex for Whites . . . . . . . . . 112

4.17 Percent Changes for Whites in Work Hours and Wage Rates (1976) Accompanying Modifications in High School Experiences, by High School Program and Sex. . . . . . . . . . 113

4.18 Percent of Whites Who Worked in 1976 in Various Work Pattern Groups, by Sex and High School Program . . . . . . . . . 114

4.19 Percent Change, for Whites, in Work Hours and Wage Rates, 1976, Accompanying a Simultaneous Modification of High School Work, Academic and Vocational Instruction. . . . . . 114

4.20 Adjusted Mean Weekly Work Hours and Wage Rates for Whites (1976), by Sex, Work Pattern, and High School Program . . . . . . . . . . . . . . . . . . . . . . . . . . . . 116

Figures

2.1 Percentage of Those in Either General or Vocational Programs Who Where Selected for Vocational Education by Father's Education. . . . . . . . . . . . . . . . . . . . . . . . . 17

2.2 Percent of White Male Pupils in High Schools With More Than Fifty Percent of Enrollment in Vocational Programs, by Percent Black in School and Father's Educational Level. . . . . . 22

2.3 Percent of White Male Pupils Enrolled in Academic Programs as a Function of Percent Vocational Enrollments in the High School for Various Levels of Father's Education and Percent Black Enrollment . . . . . . . . . . . . . . . . . . . . . . . . . 24

3.1A Hours of Academic and Vocational Instruction, by High School Program, Race and Sex, Version A. . . . . . . . . . . . . . . . . 39

3.1B Hours of Academic and Vocational Instruction, by High School Program, Race and Sex, Version B. . . . . . . . . . . . . . . . . 40

3.2A Hours of Work and Instruction, by High School Program, Race and Sex, Version A. . . . . . . . . . . . . . . . . . . . . . . . 48

3.2B Hours of Work and Instruction, by High School Program, Race and Sex, Version B. . . . . . . . . . . . . . . . . . . . . . . . 49

3.3 Hours of Instruction in English, Social Studies, Mathematics, Science, and Foreign Language, as a Function of Hours of Work for White Males . . . . . . . . . . . . . . . . . . . . . . . . . 51

3.4 Mathematics and Reading Achievement Polygons for Race and High School Program Groups. . . . . . . . . . . . . . . . . . . . . . . . 75

## Preface

### 1. Background of the Study

The data analyzed in this report were collected as a part of a major national longitudinal study of high school seniors: the National Longitudinal Study of The High School Class of 1972. This study was initiated and carried out by the National Center for Education Statistics, U.S. Department of Health, Education, and Welfare. The study was conceived as a survey of a representative, national sample of high school seniors and their schools, using questionnaires which were completed by the seniors at their schools during Spring 1972, and simultaneously by school officials. Questions directed at the pupils focussed on their backgrounds, experiences, attitudes and plans; ability tests were also administered to them. Questions directed at school officials were attempts at characterizing the school's programs and facilities and also information from the school's records about the individual pupils who were tested and responded to the questionnaires.

The population which the study attempted to sample was all twelfth graders enrolled during 1972 in all public and private schools in the 50 states and the District of Columbia. The initial sample survey has been followed up by four additional surveys of the originally sampled individuals and of a specially selected supplemental sample designed to compensate for defects found in the original sampling frame and in the implementation of the original survey. The primary sample originally consisted of 1,200 schools and was targeted to a maximum of 18 pupils per school. In actuality, 1,044 schools and 17,726 pupils participated of whom 16,683 completed the questionnaire. The supplementary sample consisted of 257 additional schools and 4,450 additional pupils. First follow up (October 1973) questionnaires were sent to 23,654 individuals and were completed by 21,350. The second (October. 1974) and third follow-up (October, 1976) questionnaires were completed by 20,872 and 20,194 individuals respectively. These questionnairs focussed on the living conditions, work experiences, education and training, military service, family status, life experiences and opinions of these individuals.* The data reported in this document were collected in the base year and the first three follow-ups. The fourth follow-up survey had not been completed when this study was initiated.

In the summer of 1978 a request for proposal was issued by the National Center for Education Statistics inviting proposals to analyze the data base which existed at that time. One of the areas in which the solicited analyses was: Effects of Vocational Schooling on Labor Market Outcomes. On August 17, 1978, the ML-Group for Policy Studies in Education, CEMREL, Inc., submitted a proposal for such analyses and reporting and a contract to pursue them was awarded on September 30, 1978. This report is one of the outcomes of that project.

## 2. Study Orientation

The perspective on which this study was based has three major elements: educational opportunity, exposure to educative activities, and the consequences of such activities for individuals' skills, orientations, and subsequent life pursuits. This perspective has been developed extensively -- in an elementary school context -- in the form of a conceptual model (Harnischfeger and Wiley, 1976) and a series of theoretical and empirical studies. The key notions are that (a) the actual (educational) experiences of an individual both in and out of school are what determine his or her acquisitions of skills and orientations toward social life, and that (b) social policies and resource allocations determine individuals' opportunities to participate in those activities and experiences. This perspective was also used in several earlier studies which focussed (in part) on secondary schooling; one of these concerned test score declines (Harnischfeger and Wiley, 1975) and another quality of education for minority pupils (ML-Group, 1978). In both of those studies key interpretive factors were the course enrollments of secondary school pupils as important determinants of educational achievement.

---

*Full description of the sample design and available data may be found in a Levinsohn, Henderson, Riccobono, and Moore, 1978.

In this study, we have made the exposure to different kinds of educational experiences a major emphasis. We have estimated, from the school record data collected in the base year survey, the number of minutes in instruction in the courses in which each pupil was enrolled over the last three years of high school. These time allocations are subdivided by curricular sub-area: English, Mathematics, Arts, Distributive Education, etc., and have been analyzed by these sub-areas and by aggregates thereof (total academic, total vocational). These allocations have been analyzed in three ways: (1) as outcomes of school and community characteristics, (2) as distributions over race and sex groups, and (3) as determinants of post-secondary activities and work characteristics.

The primary focus of these analyses has been Vocational Education. As we explain in the first chapter, Vocational Education is one grouping of cirricular programs; the other major program labels being, Academic and General. Vocational programs are distinctive however, in that they are intended to prepare pupils to enter particular occupations. Most other studies of vocational education have focussed on vocational programs and pupils only and have not had detailed information about pupils educational experiences, at least on nationally representative samples. This study is unique in that:

(a) we maintain explicit comparisons with pupils in other curricula at all stages of the analysis: opportunities, experiences, outcomes; and

(b) we explore in detail the course and work experiences of the pupils in these programs.

During the course of the study a singularly important fact became clear: The assignment, selection or choice of academic program is the overwhelming important factor in determining an individual's experiences (academic and work) during high school and also the most important school factor in subsequent work activities and monetary rewards. Thus, it may be the major vehicle of social stratification in our society.

## 3. Study Activities

The key activities of this study were:

(1) Variable specification and file construction. This activity was extensive. Part of it is reported in appendices to this report and a complete documentation of our files is given in Hwang, 1980. A most important characteristic of our files and subsequent analyses was a segmentation of the sample into race (white, black, other) by sex (male, female) subgroups. The main participants in this part of the study were Edward Haertel, Annegret Harnischfeger, Elaine Hwang, David Rindskopf, William Schmidt and David Wiley.

(2) Analysis planning and implementation. The analyses were, as mentioned above, segmented by race and sex groups. The intent there was two-fold: (a) to focus on socially important differences in experiences and the processes which determine them, i.e., to allow (statistical) interactions to emerge, and (b) to allow a (rough) cumulative assessment of error variation via (non-interactive) inconsistencies over groups. The latter was expecially important in

that it is extremely difficult to compute valid standard errors of statistical estimates, especially those pertaining to relational coefficients. The main participants in this part of the study were David Rindskopf, William Schmidt and David Wiley.

(3) Interpretation and report writing. The total project was segmented into two distinct parts: one focussing on high school counseling, the other on course exposure and post-secondary outcomes. The first emerged from planning by Schmidt and Wiley, but was implemented, written, and interpreted by William Schmidt only. This research is reported separately in High School Counseling: Resources and Impact (Schmidt, 1980). What follows is the major outcome of the second part. The analyses reported herein were sequentially organized around seven gross concepts: social background of pupils, school and community characteristics, high school program, course exposure and high school work, academic achievement, post-secondary education training, and wages and work hours. Basically, the relations among these characteristics are analyzed sequentially, the total set of analyses resembling, in informal fashion, a recursive model. The main participants in the writing and interpretation to follow were Annegret Harnischfeger and David Wiley.

## 1. Vocational Education: Curricula, Courses, and Resources

### 1.1 What is Vocational Education?

Vocational Education has come to mean something quite specific to those involved in it, but still carries a variety of meanings for the non-participant. Most specifically, vocational education refers to a set of occupational curricula or programs of study. These curricula have been codified as a part of a project begun in 1964 by the U.S. Office of Education to standardize information pertaining to curriculum and instruction. As an outcome of that project, a handbook was produced which gave detailed specifications for twenty-two major subdivisions of subject matter areas and co-curricular activities (Putnam and Chismore, 1970). Of these, seven have been designated as directly pertaining to occupational preparation. These are:*

1. Agri-Business Occupations (01 - Agriculture)
2. Marketing and Distributive Occupations (04 - Distributive Education)
3. Health Occupations (07 - Health Occupations Education)
4. Home Economics (09 - Home Economics)
5. Business and Office Occupations (14 - Office Occupations)
6. Technical Occupations (16 - Technical Education)
7. Trade and Industrial Occupations (17 - Trade and Industrial Occupations)

As a further elaboration, Home Economics has been further subdivided into Homemaking/Personal, Home and Family (09.01) and Home Economics: Occupational Preparation (09.02). For a complete list of curricula, see Appendix Table A1.

---

*The primary titles are those used in reporting the Fall 1971 survey to support the Directory of Secondary Schools and Occupational Curriculums (Osso, 1973). The codes and titles in parentheses are from Putnam and Chismore, 1970.

It is also important to note that two areas which are sometimes linked to occupational preparation -- Business (03) and Industrial Arts (10)-- are not considered to be occupational curricula, although Industrial Arts is sometimes classified as an instructional program (e.g., Chismore and Hill, 1978).

The fact that the term vocational education refers to educational programs, i.e., to

> combination(s) of courses and learning experiences organized for the purpose of preparing, upgrading, or retraining youth and adults for employment in entry, supervisory, or operational management occupations not requiring a baccalaureate degree (Chismore and Hill, 1978).

implies that care must be taken in designing and evaluating indicators of vocational participation. In its survey of offerings and enrollments in 1972/73, NCES instructed respondents to clearly differentiate pupils enrolled in occupational programs from those enrolled in courses associated with occupational programs, but who are not actually in those programs (Osterndorf, 1975):

> Before going on to Part II of this form, please review Part III, Enrollment of Pupils in Occupational Programs (page 16), to insure that you DO NOT DUPLICATE ENROLLMENT in the two sections. Part II is concerned with those individual courses for which a pupil may register in accordance with the general program of studies (curriculum) which he is following. Part III is concerned only with organized clusters or combinations of courses specifically designed for those pupils declaring their intentions to enter recognized nonprofessional careers or occupations such as those described in the State Plan for Vocational and Technical Education. The enrollment of such pupils in occupational programs is to be reported only in Part III.
>
> EXAMPLE: If a student is involved in an organized Typing and Related Occupations Program he would be counted in Part III. If Typewriting I forms an integral unit of this program, he WOULD NOT be counted in the Typewriting I course in Part II of the form; however, he would be counted in those individual courses which are not a part of his specific occupational program (English grade 11, American History, etc.). The specific course enrollment (First Year Shorthand or Record Keeping) of a pupil in a general or college preparatory curriculum WOULD be counted in Part II exclusively.

Unfortunately, data requested for programs did not include course enrollments in vocational courses for pupils in occupational curricula, only program enrollments:

> An OCCUPATIONAL PROGRAM is an organized combination or cluster of courses specifically designed for those pupils declaring their intentions to enter recognized nonprofessional careers or occupations such as those described in the State Plan for Vocational and Technical Education. Report here all pupils enrolled in such occupational programs.(Osterndorf, 1975).

This, in effect, makes it impossible using these survey data to compare enrollments in occupational-related courses, contrasting those in occupational curricula and those who are not enrolled in such curricula. The available data from the 1972/73 survey are given below (Table 1.1).

Table 1.1 Secondary Occupational and Related Course and Program Enrollments: 1972/73.

| Subject/Program Area | Course Enrollments for Those not in Occupational Programs | Occupational Program Enrollments |
|---|---|---|
| 1. Agriculture (01) | 374,666 | 241,171 |
| 2. Distributive Education (04) | 129,549 | 323,474 |
| 3. Home Economics (09) | 4,651,535 | 305,386 |
| 4. Vocational Trade and Industrial Education/ (Trades and Industry)/ Trade and Industrial Occupations (17) | 484,484 | 486,522 |
| 5. Other (Health - 07, Technical - 16) | - | 343,132 |
| 6. Business Education (03) | 6,376,633 | - |
| 7. Office Occupations (14) | - | 308,883 |
| 8. Industrial Arts | 5,726,138 | - |

Source: Osterndorf, 1975; Table B.

An independent survey (Osso, 1974), conducted in the same academic year, yielded the following total course enrollments in courses considered to be part of occupational programs (Table 1.2):

Table 1.2 Estimated Number and Percent Distribution of Secondary-level vocational Education Enrollees, by Program Area, 1972/73.

| Program Area | Number | Percent |
|---|---|---|
| Total | 6,032,000 | 100.0 |
| Agriculture | 647,000 | 10.7 |
| Distributive education | 342,000 | 5.7 |
| Health | 75,000 | 1.2 |
| Home economics (homemaking) | 1,533,000 | 25.4 |
| Home economics (occupational) | 263,000 | 4.4 |
| Office or business | 1,625,000 | 26.9 |
| Technical education | 243,000 | 4.0 |
| Trades and industry | 1,304,000 | 21.6 |

NOTE -- Percent details may not add to 100.0 because of rounding.

Source: Osso, 1974; Table II-1.

If we eliminate the ambiguous categories (Home Economics, Office or Bunsiness) where the general course offering and enrollment survey indicates large enrollments in non-vocationally related courses, we can construct estimates of vocational and non-vocational enrollments in selected voncational courses (Table 1.3).

Table 1.3 Vocational* and Non-Vocational Course Enrollments in Vocational Courses, 1972/73.

| Program Area | Vocational | Non-Vocational Number | Non-Vocational Percent | Total |
|---|---|---|---|---|
| Agriculture | 272,000 | 375,000 | (58.0) | 674,000 |
| Distribution Education | 212,000 | 130,000 | (38.0) | 342,000 |
| Trades and Industry | 820,000 | 484,000 | (37.1) | 1,304,000 |
| Health and Technical | 318,000 | 000 | ( 0.0) | 318,000 |

*These are course enrollments of those enrolled in some occupational program, not necessarily that to which the course corresponds.

Sources: Tables 1.1 and 1.2.

Thus, if these data are accurate, it appears that substantial portions of vocational course enrollments (especially in Distributive Education, Agriculture, and Trades and Industry) may be the result of the participation of pupils who are not in vocational programs.

Another comparison across surveys can be accomplished by contrasting the course enrollments reported in the 1972/73 Vocational Survey (Osso, 1974) and data on program enrollments from the 1972 NLS survey reported by Lewin-Epstein (1979). Table 1.4 reports twelfth grade course enrollments and Table 1.5 exhibits twelfth grade enrollments together with twelfth grade course enrollment data from Table 1.4.

Table 1.4 Total and Twelfth Grade Course Enrollments in Secondary Vocational Education, 1972/73.

| Program Area | Total Enrollment 1) (1000s) | % | Percent in Twelfth Grade 2) | Twelfth Grade Enrollment (1000s) | % |
|---|---|---|---|---|---|
| Agriculture | 647 | 10.7 | 19.8 | 128.1 | 5.2 |
| Distributive Education | 342 | 5.7 | 56.0 | 191.5 | 7.8 |
| Health | 75 | 1.2 | 48.1 | 36.1 | 1.5 |
| Home Economics (Homemaking) | 1,533 | 25.4 | 30.0 | 459.9 | 18.8 |
| Home Economics (Occupational) | 263 | 4.4 | 40.4 | 106.3 | 4.4 |
| Office or Business | 1,625 | 26.9 | 55.2 | 897.0 | 36.7 |
| Technical Education | 243 | 4.0 | 52.3 | 127.1 | 5.2 |
| Trade or Industry | 1,304 | 21.6 | 39.4 | 513.8 | 21.0 |
| Total | 6,032 | 100.0 | 40.5 | 2,443.0 | 100.0 |

1) Table II-1, 2) Table II-5

Source: Vocational Education: Characteristics of Students and Staff, 1972, U.S. Department of HEW, Office of Education, 1974.

Table 1.5 Twelfth Grade Program Enrollments (Spring 1972) and Twelfth Grade Course Enrollments (1972/73) in Vocational Education.

| | Enrollments (1000s) | | Course/Program | | Percent in Area | | |
|---|---|---|---|---|---|---|---|
| Program Area | Program | Course | Enrollment Ratio | | Program | Course** | |
| Agriculture | 40 | 128 | 3.20 | | 5.4 | 6.4 | |
| Business | 348 | 897 | 2.58 | | 47.0 | 45.2 | |
| Distributive Education | 55 | 192 | 3.49 | | 7.4 | 9.6 | |
| Health | 13 | 36 | 2.77 | | 1.8 | 1.8 | |
| Home Economics (Occupational) | 34 | 106 | 3.12 | | 4.6 | 5.4 | |
| Trades or Industry | 250 | 514 | 2.06 | 2.57 | 33.8 | 25.9 | 32. |
| Technical Education | | 127 | 0.51* | | | 6.4 | |
| Total | 739 | 1,983 | 2.68 | | 100.0 | 100.0 | |

* Using Trades and Industry Program Enrollments as a base.

**Restandardized from Table 1.4 by eliminating Homemaking.

Sources: Table 1.4 and Lewin-Epstein (1979).

This table yields two results of interest: The ratio of twelfth grade course to program enrollments is about 2.7 courses per enrolled pupil with the largest ratios for those areas with significant numbers of non-vocational pupils enrolled in courses. (Note: The NLS Survey did not differentiate Technical Education from Trades and Industry so we have used T and I as a base and also displayed the aggregate results. As Technical Education has no non-vocational enrollments (Table 1.3) this lowers the aggregate ratio.)

Secondly, allowing for these variations, the percentage distributions of enrollments over program areas is surprisingly consistent. It does not vary more than two (absolute) percentage points across the surveys.

## 1.2 Funding for Vocational Education

The enrollments, both program and course, which we have analyzed are majorly financed by states and local districts with supplementation and matching funds from federal sources. Between 1968 and 1977 expenditures for Vocational Education increased from $1.2 billion to $5.0 billion (Table 1.6).

Table 1.6 Expenditures for Vocational Education, by Source, 1968-1977.

| | Source($millions) | | | |
|---|---|---|---|---|
| Fiscal Year | Federal | State and Local | Total | Percent Federal |
| 1968 | 262 | 930 | 1,193 | 22.0 |
| 1970 | 300 | 1,542 | 1,842 | 16.3 |
| 1972 | 466 | 2,195 | 2,661 | 17.3 |
| 1974 | 468 | 2,966 | 3,434 | 13.6 |
| 1976 | 543 | 4,170 | 4,713 | 11.5 |
| 1977 | 534 | 4,429 | 4,963 | 10.8 |

Source: Digest of Education Statistics, 1979, Table 147.

Federal funding has generally increased until the 1977 period, although since 1972 the amounts of increase have lagged behind the rate of inflation. Local and state funds, however, have been increasing at a extremely rapid rate, averging 20.4 percent per year in the period between 1972 and 1977. Thus, the proportion of Vocational Education which is federally financed has systematically declined from 22 percent in 1968 to 11 percent in 1977.

Federal funding has gone for Basic Vocational Education Grants administered through the states, consumer and homemaking education, and work-study -- the latter programs are designed to prevent dropout or to integrate vocational education and work experience. Table 1.7 shows the distribution of these funds over subprograms in 1972 and more recently. Clearly, the bulk of the funds go directly to the states, with no legislative requirements limiting their expenditure other than special allotments for post-secondary (15%) and handicapped (10%).

Table 1.7 Program Distribution of Federal Vocational Education Funds.

| Program | Total Funds 1972 | ($1000s) 1977 | 1979 | Percent Distribution 1972 | 1977 | 1979 |
|---|---|---|---|---|---|---|
| Basic Grants | 370,619 | 462,693 | 613,268 | 88.9 | 86.6 | 92.0 |
| Consumer & Homemaking | 19,091 | 39,419 | 43,000 | 4.6 | 7.4 | 6.4 |
| Work Study/Cooperative | 24,256 | 27,634 | 5,556 | 5.8 | 5.2 | 0.8 |
| State and National Councils | 2,979 | 4,559 | 5,066 | 0.7 | 0.9 | 0.8 |
| Total | 416,945 | 534,305 | 666,890 | 100.0 | 100.0 | 100.0 |

Source: Digest of Education Statistics, 1979: Table 157.

The schools to which these funds are distributed potentially totaled 17,460 in 1971 (Table 1.8). This consisted of 58.8 percent of all secondary schools during that period.* Of these schools, 94.5 percent are regular or comprehensive schools, while 2.0 percent are specialized and 1.1 percent are combined with post-secondary training institutions. Also, these schools have varied representation of particular vocational program areas as might be inferred from previous discussion. Agriculture was available in 43.8 percent, Distributive Education in 30.2 percent, Health in 10.0 percent, Home Economics in 81.3 percent, Business and Office in 59.5 percent, Technical in 10.0 percent, and Trade and Industrial programs in 46.3 percent of the schools. Work-study programs were also common -- Cooperative, 25.7 percent, work-study, 11.2 percent (Calvert, et al., 1975, Tables 1, 3 and 4).

State funds are allocated to local districts for secondary vocational education on a number of bases: course enrollments in courses designated as supporting

---

*The Digest of Education Statistics, 1974, Table 12 reported 25,922 public schools with secondary grades in 1972/73 and 3,770 private secondary schools in 1970/71. Thus, 65.1 percent of public and 15.2 percent of private secondary schools had occupational curricula.

**Table 1.8** Number of Secondary Schools with Occupational Curriculums by Type of School and Control: Aggregate United States, fall 1971.

| Control of School | Total | Type of School<br>Regular or Comprehensive | Specialized Vocational | Combination Specialized Secondary & Technical Vocational | Other |
|---|---|---|---|---|---|
| National total | 17,460 | 16,494 | 357 | 199 | 410 |
| Public total | 16,887 | 15,998 | 351 | 188 | 350 |
| Federal | 55 | 37 | 7 | 2 | 9 |
| State | 1,363 | 1,055 | 22 | 98 | 188 |
| Local | 15,469 | 14,906 | 322 | 88 | 153 |
| Nonpublic total | 573 | 496 | 6 | 11 | 60 |
| Religious | 364 | 347 | 4 | 1 | 12 |
| Other | 209 | 149 | 2 | 10 | 48 |

Source: Calvert, et al., 1975.

occupational curricula, vocational education expenditure at the local level, or according to formula as related to costs or services. Federal funds are sometimes totally merged with state funds and then allocated to districts, in other states federal funds are separately allocated on either a routine basis or for special or new projects.

The overriding fact about these methods of funding are the difficulty they make for the tracing of funds and the universal and inextricable mixing of vocational students and non-vocational students in the funding bases and in the services paid for by federal and state vocational funds. It is impossible to tell from available data and reports, for example, if more vocational educational resources are being used for non-vocational students than for vocational ones.

## 2. The High School Class of 1972: Social Composition and Program Participation

### 2.1 The Basic Stratification: Sex and Racial/Ethnic Group

The main goal of this study was to characterize the determinants of high school pupils' educational experiences, the shape of those experiences themselves, and to begin the exploration of their consequences. A secondary but still vital aspect of the study was to exposit and describe these features separately for distinct racial/ethnic and sex groups.

Table 2.1 describes the total population decomposition of high school seniors in 1972 into the relevant groupings.

Table 2.1 Estimated Population of High School Seniors in 1972 by Racial/Ethnic Group and Sex (1000s).

| Racial/Ethnic Group | Sex | | Total |
|---|---|---|---|
| | Male | Female | |
| White | 1,270 | 1,230 | 2,500 |
| Black | 123 | 166 | 289 |
| Other | 131 | 123 | 254 |
| Hispanic | 55 | 55 | 107 |
| Non-Hispanic | 76 | 70 | 146 |
| Total | 1,525 | 1,518 | 3,043 |

Table 2.2 transforms these values into percentage terms.

Table 2.2 Percentage Decomposition of Population of 1972 High School Seniors, by Racial/Ethnic Group and Sex.

| Racial/Ethnic Group | Sex | | Total |
|---|---|---|---|
| | Male | Female | |
| White | 41.7 | 40.4 | 82.2 |
| Black | 4.1 | 5.4 | 9.5 |
| Other | 4.3 | 4.0 | 8.3 |
| Hispanic | 1.8 | 1.7 | 3.5 |
| Non-Hispanic | 2.5 | 2.3 | 4.8 |
| Total | 50.1 | 49.9 | 100.0 |

Thus, we see that over eighty percent of the seniors were white, almost ten percent were black, and only about three and one-half were Hispanic. These percentages are not representative of the corresponding age groups in the population as a whole, because blacks and Hispanics are, proportionately, more severly economically disadvantaged than whites and have a correspondingly higher dropout rate. Therefore, at the senior-in-high-school level, they are under represented. Also, black females dropout at a lower rate than black males, thus, they are more highly represented in the senior class than black males.

In the main body of the report we have used the major racial/ethnic categories, not tabulating results for Hispanics separately. This decision was made because the numerical representation of this group in the 1972 sample was too small to allow accurate comparisons on the major descriptive characteristics. Also, because of the heterogeneity of the "Other" category, we have -- except for compositional and resource-access issues -- focussed on whites and blacks, males and females.

In what follows, we have reweighted basic rates and averages when we aggregated over racial/ethnic or sex groups. In doing so we have used weights based directly on Tables 2.1 and 2.2, above. We have done this because as the population is subdivided into these subgroupings, the proportions of cases with complete data varies significantly. We have felt that our analyses would better represent the population as a whole if we reweighted using the total population weights, ignoring the variations in proportion with missing information. We also believe that the results are then more cohesive across the different analyses in the various sections of the report.

## 2.2 The Social Background of High School Seniors

The social backgrounds of seniors differs markedly by racial/ethnic group (Table 2.3).

Table 2.3 Father's Educational Level by Racial/Ethnic Group.

| Father's Education | White | Black | Other | Total |
|---|---|---|---|---|
| Less than high school (dropout) | 29.0 | 56.8 | 49.0 | 33.3 |
| High school graduate (including some college) | 51.1 | 37.5 | 39.7 | 48.9 |
| College graduate (including graduate school) | 19.9 | 5.7 | 11.3 | 17.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

Only about thirty percent of white pupils had fathers who had dropped out before high school graduation, while fully 57 percent of black pupils' fathers had done so. Similarly, twenty percent of white pupils reported that their fathers were college graduates and only six percent of black pupils so reported. We do not report here male/female differences as they were too small to be taken seriously.

## 2.3 The Social Composition of High School Programs

The racial/ethnic and sex groupings that we have been discussing, together with social background characteristics, are not proportionally distributed over high school programs. Generally, about one-fourth of high school seniors in 1972 were enrolled in vocational programs (Table 2.4), and forty-four percent in academic curricula. Here, and in all tables and discussion which follow, high school record information was used to define the "track" or program in which the pupils were enrolled.

**Table 2.4** High School Program Enrollment Distribution, by Race and Father's Education.

| | Father's Education and Race | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dropout | | | High School Graduate | | | College Graduate | | | Total | | |
| High School** Program | White | Black | Total* | White | Black | Total* | White | Black | Total* | White | Black | Total* |
| Vocational | 36.4 | 31.3 | 35.6 | 22.4 | 23.8 | 22.9 | 8.9 | 12.8 | 10.0 | 23.7 | 27.5 | 24.5 |
| General | 33.3 | 48.3 | 35.8 | 29.3 | 43.5 | 31.3 | 20.4 | 32.8 | 21.8 | 28.7 | 45.8 | 31.2 |
| Academic | 30.3 | 20.4 | 28.6 | 48.3 | 32.7 | 45.8 | 70.7 | 54.4 | 68.3 | 47.6 | 26.7 | 44.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*This figure represents the whole (sub)population, including racial/ethnic groups other than those here categorized as whites and blacks (e.g., Hispanics).

** Defined by school record information.

However, proportionately more blacks (27.5%) than whites (23.7%) were enrolled in vocational curricula and considerably greater percentages of whites (47.6%) than blacks (26.7%) were enrolled in academic programs. In absolute terms, however, the vocational tracking of pupils is not very discrepant between blacks and whites -- the enrollment rate for blacks exceeding that for whites by 16 percent. The largest discrepancies seem to occur in the academic programs and in the "general" category of studies. The black enrollment rate in the academic categories being 44 percent smaller than that for whites, while in the "general" category it is 59 percent greater.

Table 2.5 displays these discrepancies in percentage terms by level of father's education. There, we see that vocational program enrollment processes for racial groups depend clearly and differentially on social background. Black pupils whose fathers were dropouts are less likely (-14%) to enroll in vocational programs, while those reporting their father's college graduation are much more likely (+44%) to do so. Uniformly, however, black pupils of any social background are less likely than whites to enroll in academic curricula and more likely to undertake a general program of studies.

Table 2.5 Percent by Which Black Enrollment Rates for High School Programs Exceed Those for Whites, by Father's Educational Level.

| High School Program | Dropout | High School Graduate | College Graduate | Total |
|---|---|---|---|---|
| Vocational | -14 | + 6 | +44 | +16 |
| General | +45 | +48 | +61 | +59 |
| Academic | -33 | -32 | -23 | -44 |

Females and males also show differential enrollment patterns (Table 2.6). Generally, females are enrolled to a greater degree in vocational programs while

Table 2.6 High School Program Enrollment Distribution, by Sex and Father's Education.*

| High School Program | Father's Education and Sex | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Dropout | | High School Graduate | | College Graduate | | Total | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| Vocational | 20.0 | 25.7 | 32.8 | 38.4 | 8.6 | 11.3 | 21.7 | 27.3 |
| General | 50.1 | 46.9 | 20.1 | 17.2 | 23.5 | 20.3 | 32.7 | 29.7 |
| Academic | 29.9 | 27.4 | 47.1 | 44.4 | 67.9 | 68.4 | 45.6 | 43.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*See Table 2.5 for totals over sex groups.

males participate more in general and academic curricula. In percentage terms, the discrepancy between the sexes is relatively independent of social background (Table 2.7); vocational enrollment rates for females exceeding those for males

Table 2.7 Percent by Which Female Enrollment Rates for High School Programs Exceed Those for Males, by Father's Educational Level.

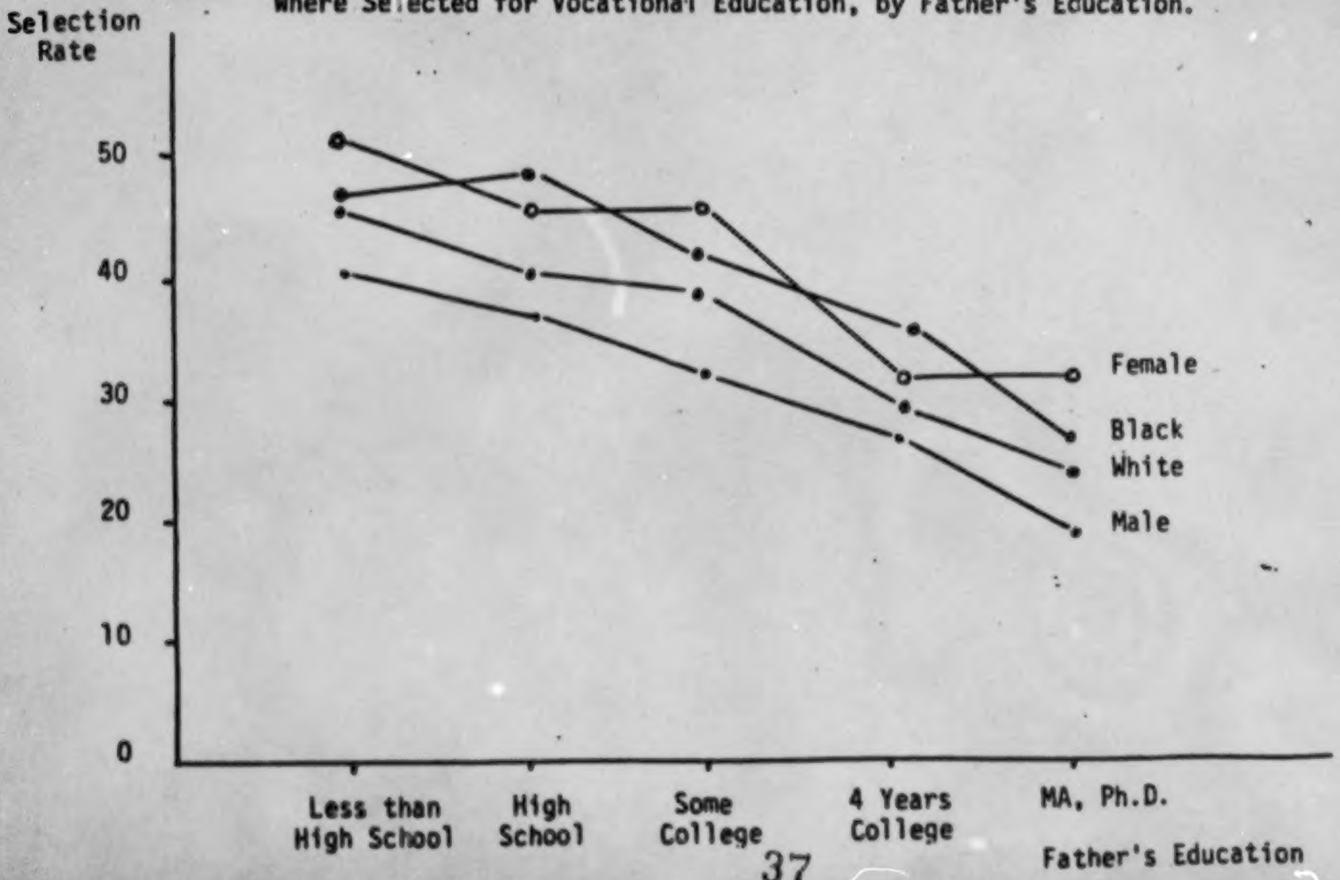
| High School Program | Father's Education | | | |
|---|---|---|---|---|
| | Dropout | High School Graduate | College Graduate | Total |
| Vocational | +17 | +29 | +31 | +26 |
| General | -14 | - 6 | -14 | - 9 |
| Academic | - 6 | - 8 | + 1 | - 6 |

by 26 percent, while general and academic rates are nine and six percent lower, respectively. However, there are some trends and individual discrepancies worth noting: vocational enrollment differentials are greatest for pupils with higher levels of fraternal education, and while academic rate differences are lower for pupils whose fathers' were not graduated from college, they reach parity for those pupils whose fathers reached that level of education.

In the next chapter, we will see that tested aspects of developed academic abilities in reading and mathematics do not greatly differ between those enrolled in general versus vocational programs, regardless of the race or sex of the pupil. If this is even approximately true at the time that pupils are selected into particular high school programs, then we can profitably focus on differential enrollment rates of the race and sex groups by restricting our focus to those who enrolled in either the vocational or general programs.

Figure 2.1 graphically displays the percentages of those in non-academic programs who were selected for vocational education, by father's educational level. Clearly, for pupils of all social backgrounds, females and blacks are more often selected for vocational programs, although the rate of selection diminishes systematically for all groups as father's educational level increases.

Figure 2.1 Percentage of those in Either General or Vocational Programs Who Where Selected for Vocational Education, by Father's Education.



The result of these selection processes is a racial and sex composition of the enrollments in the various curricula. Table 2.8 exhibits this composition for the vocational programs and Table 2.9 for academic programs.

Table 2.8 Race and Sex Composition of Vocational Program Enrollments.

| | Racial Group | | | |
|---|---|---|---|---|
| Sex Group | White | Black | Other | Total |
| Males | 34.9 | 4.6 | 5.0 | 44.4 |
| Females | 44.7 | 6.1 | 4.8 | 55.6 |
| Total | 79.5 | 10.7 | 9.8 | 100.0 |

Table 2.9 Race and Sex Composition of Academic Program Enrollments.

| | Racial Group | | | |
|---|---|---|---|---|
| Sex Group | White | Black | Other | Total |
| Males | 45.9 | 2.3 | 3.4 | 51.6 |
| Females | 42.4 | 3.4 | 2.6 | 48.4 |
| Total | 88.3 | 5.7 | 6.0 | 100.0 |

The major conclusions to be drawn from these tables is that females are substantially over-represented in vocational programs -- 56 percent enrolled versus 50 percent in the population (Table 2.2) -- and blacks are under-represented in academic programs -- six percent enrolled versus ten percent in the population (Table 2.2).

## 2.4 Contextual Effects on High School Program Selection Processes

The process of an individual's selection for participation in a particular high school program is, as we have seen, strongly conditioned by that individual's race, sex and social background. These are characteristics which the pupil brings with him to the schooling process, they are not -- at the individual level -- aspects of that process. However, in the aggregate, individual characteristics affect the way in which the educational process is organized and carried out. Thus, for example, it is entirely possible that schools with large numbers of black pupils have evolved or constructed processes of pupil assignment to high school programs which differ systematically from those used in schools with few black pupils. If this were so, a pupil if enrolled in a school with few blacks might, e.g., be much more likely to end up in a vocational program than that same pupil if enrolled in a school with many blacks.

Thus, in a statistical sense, a contextual effect is an interaction. That is, a social characteristic of a school, e.g., percent black, indexes differences in processes whereby pupils with identical characteristics, e.g., race, sex, social background, are differentially treated, e.g., placed at different rates into district curricula. The methodological controversies over the detection of such effects come about because of ambiguities in the relation of statistical models used for analysis to the underlying issues being investigated and the adequacy with which those models and the data to which they are applied, allow valid inferences of such effects.

As a part of our analyses we engage in some preliminary investigation of two characteristics which could give rise to contextual effects. These are race and high school program, itself. And these characteristics present entirely different instructional problems: Race, because of the separation of individual from school origins of effects, and programs, because it is in fact the outcome of the process being investigated.

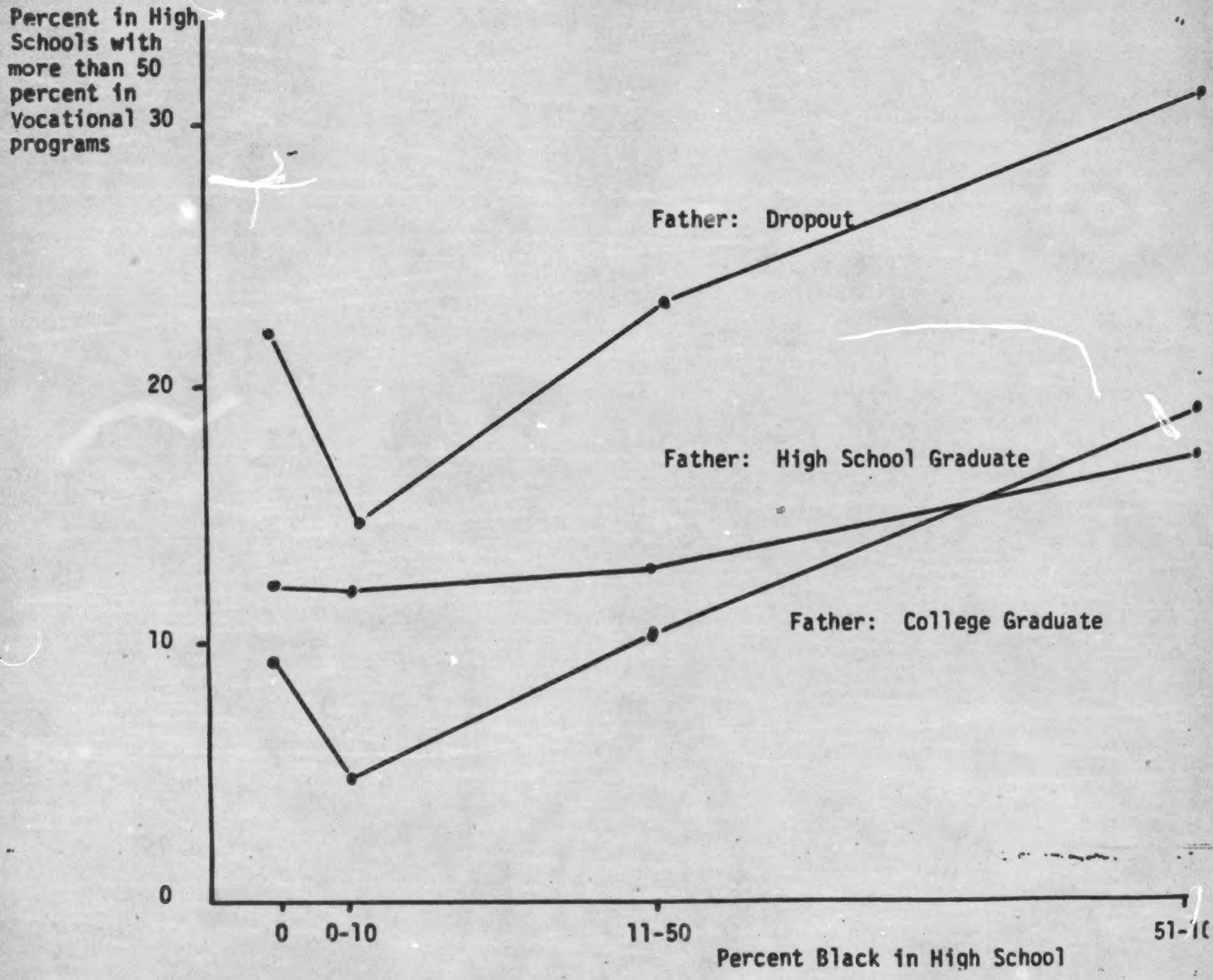
In our sense, a contextual effect of high school programs means that schools with varying percentages of, e.g., students in vocational programs, have different selection processes for such programs. At the extremes this effect is almost trivial. That is, schools which do not have vocational programs are unlikely to create them if one or a few "vocational-type" pupils show up at fall enrollment time. And schools which are solely devoted to vocational training are not likely to create an "academic" program for students with histories of "academic" training and performance. It is also surely credible that in some schools -- given the social and financial investments that these schools must make in their reputations, available equipment and teaching skills -- there will be inertia in modifications of program components and their distribution, even when compositions of pupils' social and academic backgrounds are rapidly changing.

On the other hand, a contextual effect for race on high school programs would be a substantively more subtle phenomenon. One vehicle for such an "effect" would seem to be indirect -- mediated through the vocational effects discussed above. With this vehicle, schools with large percentages of black pupils might have larger proportions of pupils in vocational programs -- either because of the generally lower social and economic status of the black families or because administrators believed that heavily black schools "ought to" have strong vocational programs. Another vehicle for such an "effect" would be, at first glance, direct. Such an effect would imply that, independent of differences in schools' program emphases (e.g., vocational vs. academic), black pupils in heavily black schools would be selected into vocational education at higher rates than in other schools and that white pupils in such schools would also be selected at higher rates. The latter is required to define the effect as contextual rather than individual. However, if both black and white pupils are selected at higher rates then all pupils are selected at higher rates. Thus, the percentage of pupils in vocational programs must be higher than in "other schools." Thus, these two vehicles cannot be conceptionally disentangled and we are left with the inference that any context effect of race must be mediated, though, accompanied by, or synergistic with a contextual effect of high school program itself. As this is a logical rather than an empirical issue, it would seem that more conceptual work on these effects is necessary for clarity of inference.

Of our data analyses, an illustrative example is useful. Figure 2.2 displays the concentration of white male pupils in high schools with heavily vocational orientations (more than fifty percent of enrollment in vocational programs) as a function of percent black in the school, for each of three levels of father's education. We can see that for all levels of father's education, in vocationally-oriented high schools with black pupils, there is a positive relation between percent black and the percentage of white males who are enrolled in these schools. This implies that if there is a generalizable contextual effect of percent pupils in vocational programs on selection processes that this effect will also be associated with the racial composition of the school.

To address this issue, we examined the tabulation of four categories of percent in vocational programs -- at the school level, percent black in the school (four categories), pupil's father's education (three categories), and pupil's program (three categories). Using these data we calculated the median discrepancies in rates of program selection between the most extreme contrasts in each set of categories (zero vs. 51 to 100% vocational, zero vs. 51 to 100 percent black, father dropout vs. father college graduate), holding the other characteristics constant. These medians were 23 percent (percent vocational enrollment), -32 percent (father's education), and 0 percent (percent black enrollment). Thus, controlling for the percent enrolled in vocational programs there was no effect of racial composition, a result in line with the earlier argument.

Figure 2.2 Percent of White Male Pupils in High Schools With More Than Fifty Percent of Enrollment in Vocational Programs, by Percent Black in School and Father's Educational Level.



Empirically, however, an argument for a contextual effect of program composition is harder to support. Figure 2.3 displays the percent of white male pupils who enroll in academic programs as a function of percent vocational enrollments in the school for various levels of father's education and percent of school enrollment which is black. Of the thirty-six line segments representing relations drawn from adjacent categories of vocational enrollment sixteen are negative. Overall, of the twelve differences between zero and 51 to 100 percent vocational, all but one are positive and that one is based on the smallest sample size. Clearly, the relationships between percent in vocational programs and selection into academic curricula are negative for most levels of pupils' fathers' education and schools' racial compositions.

This result , however, is subject to alternative interpretations, because it represents the relationship after controlling for only one individual characteristic: father's education.

One could claim that program selection processes (tracking) are based on other individual characteristics (e.g., prior academic achievement) which are not completely captured by our measure of social background. The problem is then that, in the absence of a stronger theoretical scheme, it is always possible to argue that an unmeasured individual characteristic accounts for the observed relation.

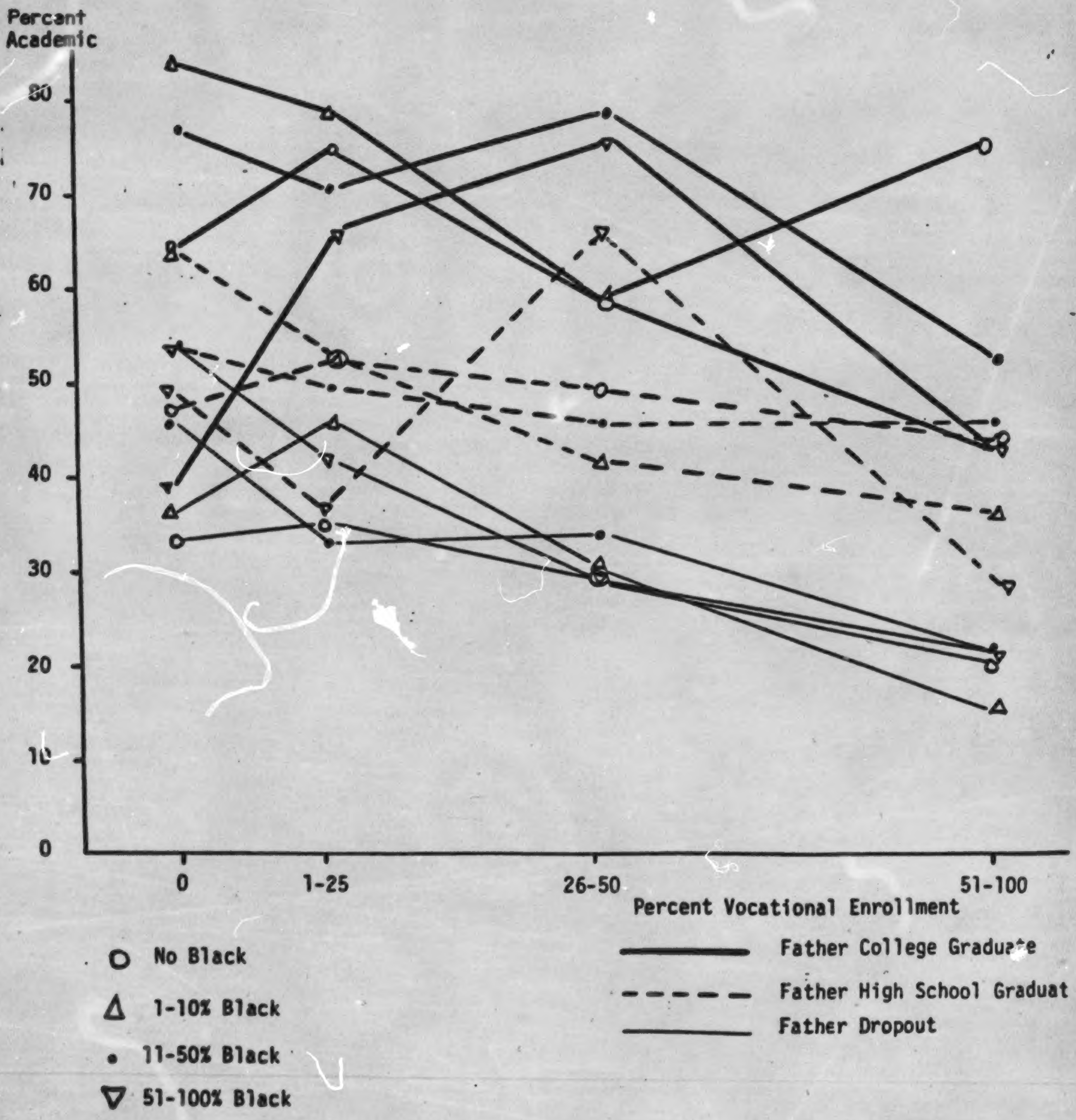


**Figure 2.3** Percent of White Male Pupils Enrolled in Academic Programs as a Function of Percent Vocational Enrollments in the High School for Various Levels of Father's Education and Percent Black Enrollment.

## 3. Occupational and Academic Programs: School Offerings and Pupil Experiences

### 3.1 Vocational Offerings: Programs and Courses

Given the clear distinction which we made between enrollments in vocational programs and enrollments in vocational courses, it is implied that a corresponding distinction can be made with respect to program and course availability, i.e., offerings. Conceptually, if a school has a vocational program, it must offer courses in the program area, but if a school does not have a vocational program, it may or may not offer courses which can be classified under the program ruberic. Table 3.1 displays the rates of program and course offering as they affect pupils of different races and sexes.

Table 3.1 Percentage of Pupils in Schools Offering Vocational Programs and Courses, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 1. In schools offering vocational programs | 88.5 | 90.0 | 87.4 | 86.3 |
| 1A. In schools offering vocational courses | 99.8 | 99.9 | 100.0 | 99.3 |
| 1B. In schools not offering vocational courses | 0.2 | 0.1 | 0.0 | 0.7 |
| 2. In schools not offering vocational programs | 11.5 | 10.0 | 12.6 | 13.7 |
| 2A. In schools offering vocational courses | 90.4 | 93.3 | 91.5 | 88.1 |
| 2B. In schools not offering vocational courses | 9.6 | 6.7 | 8.5 | 11.9 |
| 3. In any school offering vocational courses [(1) (1A) + (2) (2A)] | 98.7 | 99.2 | 98.9 | 97.8 |
| 4. In schools not offering vocational courses [100-(3)] | 1.3 | 0.8 | 1.1 | 2.2 |

We saw above that 58.8 percent of all secondary schools in 1971 offered occupational curricula. However, in terms of pupils, almost 90 percent of all pupils are enrolled in such schools, with blacks having slightly less availability than whites. Within the error limits of the data, all schools with such curricula offer vocational courses, while about 90 percent of the schools not offering a vocational curriculum offer at least one vocational course. All in all, close to 99 percent of all secondary pupils, by this analysis, are in schools offering at least one vocational course.

If we look more closely at the specific program areas, we find, as expected, considerable variation in the availability of courses of particular types (Table 3.2).

Table 3.2 Percentage of Pupils in Schools Offering at Least One Course in a Vocational Area, by Area, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Area | Males | Females | Males | Females |
| Agriculture | 35.8 | 36.0 | 34.0 | 34.5 |
| Business | 94.3 | 96.3 | 95.4 | 94.2 |
| Distributive Education | 57.6 | 58.3 | 69.5 | 68.3 |
| Health | 28.1 | 27.9 | 36.1 | 36.0 |
| Home Economics | 90.6 | 93.8 | 91.1 | 93.2 |
| Trade and Industry | 80.2 | 80.2 | 83.8 | 79.1 |

Here we see that Health Occupations course work is least available -- to 28 percent of white pupils and 36 percent of blacks, while Business and Trades and Industry Courses are most available -- about 95 and 80 percent, respectively. The only marked racial and sex variations are for Distributive Education and Health, which are considerably more available to blacks, and Home Economics which is somewhat more available to females.

Below (Table 3.3), we exhibit the distribution of number of areas available to various groups.

Table 3.3 Number of Vocational Areas Offered, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Number of Areas | Males | Females | Males | Females |
| 0 | 3.7 | 1.9 | 1.4 | 2.4 |
| 1 | 3.3 | 1.6 | 3.7 | 1.8 |
| 2 | 6.3 | 8.6 | 4.0 | 5.7 |
| 3 | 18.6 | 19.8 | 15.1 | 15.4 |
| 4 | 36.5 | 36.1 | 40.9 | 38.5 |
| 5 | 23.5 | 25.0 | 27.9 | 29.2 |
| 6 | 8.0 | 7.0 | 7.0 | 7.0 |

The first line is somewhat inconsistent with Table3.1,because of variations in missing data as the number of characteristics in the underlying tabulation changes. Generally, the data reflect the differences exhibited in Table 3.2, percents associated with larger numbers of areas (4 or 5) being associated with greater percentages for blacks than whites. The total number of areas offered is, of course, a summarization of the various patterns of offerings. Table 3.4 exhibits those patterns.

**Table 3.4** Patterns of Vocational Education Course Offerings, by Race and Sex.

| Number of Areas | Agriculture | Business | Distributive Education | Health | Home Economics | Trades and Industries | Percent Pupils with Various Combinations | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | White | | Black | |
| | | | | | | | Male | Female | Male | Female |
| 0 | 1 | 1 | 1 | 1 | 1 | 1* | 3.7 | 1.9 | 1.4 | 2.4 |
| 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2.2 | 0.9 | 1.5 | 0.1 |
| 2 | 1 | 2 | 1 | 1 | 2 | 1 | 5.1 | 8.0 | 2.1 | 4.6 |
| 3 | 1 | 2 | 1 | 1 | 2 | 2 | 11.2 | 11.5 | 4.6 | 5.7 |
| 4 | 1 | 2 | 1 | 2 | 2 | 2 | 2.6 | 2.4 | 3.8 | 2.4 |
| 3 | 1 | 2 | 2 | 1 | 2 | 1 | 2.6 | 2.7 | 2.1 | 2.6 |
| 4 | 1 | 2 | 2 | 1 | 2 | 2 | 21.9 | 21.7 | 26.7 | 24.3 |
| 5 | 1 | 2 | 2 | 2 | 2 | 2 | 12.2 | 13.2 | 16.9 | 18.3 |
| 3 | 2 | 2 | 1 | 1 | 2 | 1 | 3.5 | 3.6 | 6.4 | 6.4 |
| 4 | 2 | 2 | 1 | 1 | 2 | 2 | 9.2 | 9.0 | 6.9 | 7.0 |
| 5 | 2 | 2 | 1 | 2 | 2 | 2 | 3.3 | 3.1 | 3.0 | 4.4 |
| 4 | 2 | 2 | 2 | 1 | 2 | 1 | 1.6 | 1.8 | 1.0 | 2.2 |
| 5 | 2 | 2 | 2 | 1 | 2 | 2 | 8.1 | 8.6 | 8.0 | 6.0 |
| 6 | 2 | 2 | 2 | 2 | 2 | 2 | 8.0 | 7.0 | 7.0 | 7.0 |
| Remainder | | | | | | | 7.4 | 4.6 | 8.6 | 6.6 |

*"1" designates area not offered, "2" area offered.

The most striking disparity is racial: The combinations involving Business, Distributive Education, Home Economics, Trades and Industry, but not involving Agriculture (122122 and 122222) are considerably higher for blacks (43.6% vs. 34.1% for males and 42.6% vs. 34.9% for females). There is a slight opposing tendency for the four-area combination plus agriculture, but not enough to balance the approximately nine percent discrepancy. Apparently, the schools in which large numbers of black pupils are enrolled are more likely to offer all four basic vocational areas.

Following are two tables (3.5 and 3.6) which exhibit associations between vocational offerings and school characteristics: School size (enrollment) and Region.

Table 3.5 Percent of Pupils in Schools Offering Five or Six Vocational Areas, by School Size, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Size of School | Male | Female | Male | Female |
| Less than 300 | 7.3 | 6.0 | 3.2 | 1.9 |
| 300 - 499 | 25.1 | 20.8 | 29.2 | 29.9 |
| 500 - 999 | 24.9 | 24.2 | 28.2 | 32.2 |
| 1,000 - 1,499 | 32.6 | 33.8 | 37.3 | 35.7 |
| 1,500 - 1,999 | 35.9 | 37.9 | 43.3 | 47.1 |
| 2,000 - 2,499 | 47.5 | 50.9 | 35.2 | 40.7 |
| More than 2,500 | 46.0 | 51.7 | 53.9 | 54.3 |

As one would expect, school size (Table 3.5) is strongly related to the extensiveness with which areas are represented in the curriculum. In the smallest schools (less than 300 pupils), fewer than ten percent of pupils are exposed to more than four vocational areas, and this lack of opportunity is more severe for blacks than whites. In the largest schools, however, about fifty percent of pupils have these opportunities. And generally, except for the largest or the smallest schools, blacks have greater exposure to extensive area coverage.

Vocational offerings also differ by Region (Table 3.6). Generally, more extensive offerings are available in the West, followed by the South and the Northeast, with the Midwest having the least. Racial differences are important, however, within each region. Blacks have greater opportunity than whites in the Northeast, because of heavy vocational offerings in urban areas and lack of agricultural offerings in rural areas, where only whites are located. The reverse is true in the Midwest and South with agricultural offerings raising the percent of (rural) whites who are exposed to these offerings. The process balances in the West, producing only small racial discrepancies.

Table 3.6 Percent of Pupils in Schools Offering Five or Six Vocational Areas, by Region, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Region | Male | Female | Male | Female |
| Northeast | 26.6 | 25.8 | 44.3 | 53.9 |
| Midwest | 25.3 | 26.7 | 22.8 | 23.9 |
| South | 35.7 | 38.2 | 33.9 | 34.0 |
| West | 46.5 | 43.6 | 46.9 | 51.3 |

In summary, almost all secondary schools in 1972 offered courses which they were willing to classify as vocational-technical, even though less than 90 percent of all schools claimed vocational-technical program enrollments. Nationwide, there was little variation in the total rate of exposure to either courses or curricula between black and white, male and female pupils. However, significant variations did occur over racial/ethnic and sex groupings in exposure to particular occupational curricula, number of available, and the available combinations of areas. The availability of offerings also varied by school size and geographic region, the most striking finding related to the enormously greater availability to blacks than whites of many vocational areas in secondary schools located in the Northeastern United States.

## 3.2 Exposure to Instruction

The core premise on which this study is based is that a pupil's instructional pursuits, however determined, are the most salient aspect of his school experience and have the most important lasting effects on his achievements, both academic and occupational. Consequently, we have taken some care in defining the indicators used to describe those pursuits.

During the base-year data collection on the High School Class of 1972, a school record information form was filled out by school officials on the pupils selected for study. A part of that form requested detailed course-taking information for the final three years of high school by curricular area from the pupil's academic record. These data were transformed, in a fashion described in Appendix B, to yield estimates of the total numbers of instructional hours in each of the academic areas over the three year period. These were then standardized to a weekly basis by dividing the product of 36 (weeks) and three (years). These numbers are the primary indicators reported in this section.

The academic areas into which the pupils' pursuits were subdivided are listed on the left side of Table 3.7. As can be seen there, only six vocational course areas were designated, Technical Education (primarily a post-secondary area) being omitted. In what follows we assume that technical course enrollments

Table 3.7 Percent of Pupils Taking at Least One Course in Various Academic, Areas, by Race and Sex.

| Area | White Male | White Female | Black Male | Black Female |
|---|---|---|---|---|
| Academic | | | | |
| Science | 93.6 | 91.2 | 94.4 | 94.1 |
| Foreign Language | 53.7 | 60.1 | 33.5 | 45.5 |
| Social Studies | 98.4 | 98.7 | 97.5 | 97.6 |
| English | 98.3 | 98.6 | 97.5 | 98.2 |
| Mathematics | 91.9 | 87.5 | 91.2 | 91.2 |
| Industrial Arts | 47.2 | 7.2 | 43.0 | 8.4 |
| Commercial | 52.4 | 75.5 | 43.1 | 69.3 |
| Arts | 36.2 | 49.9 | 41.3 | 44.3 |
| Vocational-Technical | | | | |
| Agriculture | 8.6 | 1.0 | 12.5 | 0.9 |
| Business or Commercial | 38.3 | 57.5 | 31.0 | 57.1 |
| Distributive Education | 4.4 | 5.1 | 5.8 | 6.9 |
| Health Occupations | 3.1 | 5.3 | 3.2 | 8.8 |
| Home Economics | 5.9 | 38.3 | 7.5 | 43.0 |
| Trade or Industrial | 34.0 | 4.7 | 36.8 | 7.2 |
| Any Vocational Area (all) | 63.7 | 71.8 | 67.8 | 75.7 |
| (Not in Vocational Program) | 43.3 | 44.8 | 40.3 | 48.2 |
| Any Area | 100.0 | 100.0 | 100.0 | 100.0 |

are categorized with Trades and Industry in that the occupations in these two categories are not easily distinguishable from each other, but are readily separated from the other areas (see Appendix A and Section 1). Also, it should be recalled from the earlier discussion that Industrial Arts and "Commercial" courses are not considered to be parts of occupational or "vocational" curricula as they are not designed to lead to employment in specific occupations. Thus, vocational area courses have been restricted to those with the labels given in Table 3.7 under the heading Vocational-Technical (this was the general category label used in the questionnaire, see Appendix C).

Table 3.7 gives the percentage of pupils, by race and sex, who had enrolled in at least one course in each of the curricular areas. English and Social Studies were taken by almost all pupils regardless of race or sex. Mathematics and Science were taken at uniformly high levels (in excess of 90%), except for white females who had somewhat lower exposure. Foreign Language courses were taken more often by whites and females (more than half the time), but black males had particularly low rates of exposure (34%), beginning course work at only 62 percent of the white male rate. Arts (fine and performing) courses were taken by less than fifty percent of pupils in every group, but blacks and females had generally greater exposure.

Rates of exposure to Industrial Arts and Commercial Courses exhibit large sex differences and small racial differences. Industrial Arts is taken by almost 50 percent of males, but by less than ten percent of females and commercial courses are taken by only about half of the males, but almost seventy-five percent of females. Courses formally classified as vocational-technical exhibit similar sex stereotyping. Courses relating to Business or Commercial Occupations and Home Economics being initiated predominantly by females, while Agriculture and Trade or Industrial occupations had predominantly male course taking. Distributive Education and Health occupations were more evenly split. Exposure to at least one vocational-technical course regardless of sub-area is quite high, over two-thirds of all pupils having such exposure. Male-female differences in minimal exposure are educationally significant, females having about twelve percent greater exposure than males. If we restrict our vision to those who are not enrolled in vocational-technical curricula, sex differences in exposure to such courses are greater for blacks (increasing to 20%) and smaller for whites (decreasing to 3%).

If we take a greater overview and look at average hours of total exposure to selected areas (Table 3.8), we also find important differences. Science and Mathematics are taken less extensively by females than males, but racial differences are not large, reflecting the above exposure differences. However, if we restrict the averaging to those who took at least one course, sex differences diminish but do not vanish, indicating that the total exposure gap between males and females is due both to lack of initial exposure to the areas and to less extensive courses taken once study was begun. Foreign language differences, both between sexes and races, almost disappear when we restrict our average total instructional hours for those who have taken at least one course. Both the white and female advantages in total exposure are almost entirely due to differences in the rates at which the groups initiate course taking, depth of exposure varying little across groups for those who begin instruction. This finding also applies to instructional exposure in Industrial Arts, Commercial instruction, Fine and Performing Arts and to Vocational-technical courses in total. Differences in these areas, especially the large sex discrepancies, diminish considerably when we remove the discrepancies in initial exposure.

Table 3.8 Average Hours of Instruction in Selected Academic Areas, Total and For Those Taking at Least One Course, by Race and Sex.

| | Total Mean Hours | | | |
|---|---|---|---|---|
| | White | | Black | |
| Area | Male | Female | Male | Female |
| Science | 2.89 | 2.48 | 2.69 | 2.51 |
| Foreign Language | 1.36 | 1.63 | 0.86 | 1.14 |
| Mathematics | 2.98 | 2.42 | 2.83 | 2.66 |
| Industrial Arts | 1.60 | 0.15 | 1.33 | 0.22 |
| Commercial | 1.14 | 2.95 | 1.02 | 2.47 |
| Arts | 1.03 | 1.52 | 1.17 | 1.15 |
| Total Vocational | 2.68 | 3.63 | 3.02 | 4.00 |

| | Mean Hours for Those Taking At Least One Course | | | |
|---|---|---|---|---|
| | White | | Black | |
| | Male | Female | Male | Female |
| Science | 3.09 | 2.72 | 2.85 | 2.67 |
| Foreign Language | 2.53 | 2.71 | 2.57 | 2.51 |
| Mathematics | 3.24 | 2.76 | 3.10 | 2.92 |
| Industrial Arts | 3.39 | 2.08 | 3.09 | 2.62 |
| Commercial | 2.18 | 3.91 | 2.37 | 3.56 |
| Arts | 2.85 | 3.05 | 2.83 | 2.60 |
| Total Vocational | 4.21 | 5.06 | 4.45 | 5.28 |

Average hours of instruction received by pupils in these four groups, for all curricular areas, totally and for each academic program, are given in Appendix Table D1. These data are summarized in the following Tables. Table 3.9 exhibits percent differences between white males and white females, black males and black

**Table 3.9** Discrepancy in Course Hours: Blacks and Females Compared to White Males, by High School Program.

| Area | General | | | Academic | | | Vocational | | |
|---|---|---|---|---|---|---|---|---|---|
| | White Female | Black Male | Black Female | White Female | Black Male | Black Female | White Female | Black Male | Black Female |
| Science | - 13.6 | 0.0 | - 8.2 | - 14.3 | - 2.5 | - 10.0 | - 15.2 | + 17.7 | + 6.1 |
| Foreign Language | + 12.2 | - 32.9 | - 12.2 | + 20.0 | - 4.2 | + 8.8 | + 20.0 | - 16.7 | + 83.3 |
| Social Studies | - 4.3 | - 3.8 | - 5.0 | - 1.6 | + 4.3 | - 1.3 | - 3.0 | - 0.5 | + 0.3 |
| English | - 1.5 | - 1.3 | + 1.3 | 0.0 | + 6.0 | + 2.1 | - 0.5 | + 0.2 | + 0.7 |
| Mathematics | - 21.8 | + 3.9 | - 0.8 | - 15.4 | - 1.4 | - 7.7 | - 19.6 | + 13.7 | + 1.0 |
| Industrial Arts | - 89.7 | - 18.6 | - 87.1 | - 85.0 | - 5.0 | - 72.5 | - 94.6 | - 52.5 | - 92.9 |
| Commercial | +104.8 | - 23.1 | + 53.7 | + 65.9 | +13.6 | + 65.9 | + 341.6 | - 29.6 | + 210.4 |
| Arts | + 34.8 | - 6.4 | - 23.4 | + 76.3 | +15.5 | + 43.3 | + 44.1 | + 61.0 | + 59.3 |
| Agriculture | - 88.6 | + 28.6 | - 91.4 | - 90.0 | +60.0 | - 100.0 | - 98.6 | - 7.0 | - 100.0 |
| Business | +119.8 | - 17.0 | + 60.4 | + 64.1 | +12.5 | + 90.6 | + 395.8 | - 34.7 | + 306.3 |
| Distributive Education | + 40.0 | + 40.0 | + 90.0 | - 33.3 | -67.7 | - 67.7 | - 20.0 | + 5.7 | + 25.7 |
| Health Occupations | +100.0 | +200.0 | +350.0 | + 60.0 | -20.0 | + 580.0 | + 366.7 | +100.0 | + 800.0 |
| Home Economics | +788.2 | 0.0 | +758.8 | +1200.0 | +50.0 | +1525.0 | +1442.9 | +228.6 | +1571.4 |
| Trade or Industrial | - 88.5 | - 13.9 | - 91.0 | - 92.7 | + 2.4 | - 82.9 | - 92.2 | - 14.2 | - 81.3 |

females, respectively, in total instructional hours for each curricular area, by high school program. In the academic course areas, differences in sex and race groups are generally duplicated across the programs, however, blacks in academic curricula are much closer to white males in Foreign Language exposure and blacks in vocational curricula generally have greater amounts of instruction in Mathematics and Science than white males.

If we focus on Art, Vocational-Technical, and related courses, we see some important differences among curricula: sex differences are generally sharper in the Vocational programs and black males in academic curricula differ less than in other curricula from white males in course exposure averages.

Table 3.10 focusses directly on these program differences by contrasting vocational and academic program exposure means for each sex/race group separately. Extreme values index course areas in which there are large discrepancies between pupils in vocational versus academic programs. The largest discrepancies are for Foreign Languages, in which academic pupils take considerably more work and for Trade and Industrial occupations and Distributive Education which are primarily taken by vocational pupils. Program separation, although not as extreme, is also large for Agriculture (males only), Industrial Arts (males only), Home Economics and Business and Commercial (females only). Health occupations exhibits an unusual pattern of program separation, being more heavily vocational for black males and white females, but more strongly academic for white males and black females.

Table 3.10 Discrepancy in Instructional Hours Between Vocational and Academic Programs as a Percent of Vocational Program Hours.

| Area | White Male | White Female | Black Male | Black Female |
|---|---|---|---|---|
| Science* | -44.5 | -45.1 | -33.0 | -34.5 |
| Foreign Language* | -86.0 | -74.4 | -87.9 | -76.6 |
| Social Studies* | - 1.9 | - 3.2 | - 6.4 | - 0.3 |
| English* | - 3.0 | - 3.5 | - 8.3 | - 4.3 |
| Mathematics* | -44.0 | -46.8 | -35.4 | -34.0 |
| Industrial Arts | -73.1 | -25.0 | -46.1 | + 4.8 |
| Commercial | -29.6 | -73.6 | +13.6 | -62.4 |
| Arts* | -39.2 | -50.3 | -15.2 | -32.4 |
| Agriculture | -85.9 | 0.0 | -75.8 | 0.0 |
| Business | -32.6 | -77.7 | +16.1 | -68.4 |
| Distributive Education | -91.4 | -92.9 | -97.3 | -97.7 |
| Health Occupations | +66.7 | -42.9 | -33.3 | +25.9 |
| Home Economics | -42.9 | -51.9 | -73.9 | -44.4 |
| Trade or Industrial | -88.5 | -89.3 | -86.3 | -89.6 |

*For these subject areas academic program hours is the base for the percentage.

These curricular differences can be summarized and highlighted by graphical displays (Figures 3.1A and 3.1B). We have plotted the total hours of Vocational and Academic (Total minus Vocational) Instruction as a two-dimensional graph: abscissa values equalling the vocational hours and ordinate values equalling the academic hours. The points plotted are the pairs of values for twelve combinations of programs (academic, general, vocational), race (black, white), and

**Figure 3.1A** Hours of Academic and Vocational Instruction, by High School Program, Race and Sex, Version A.

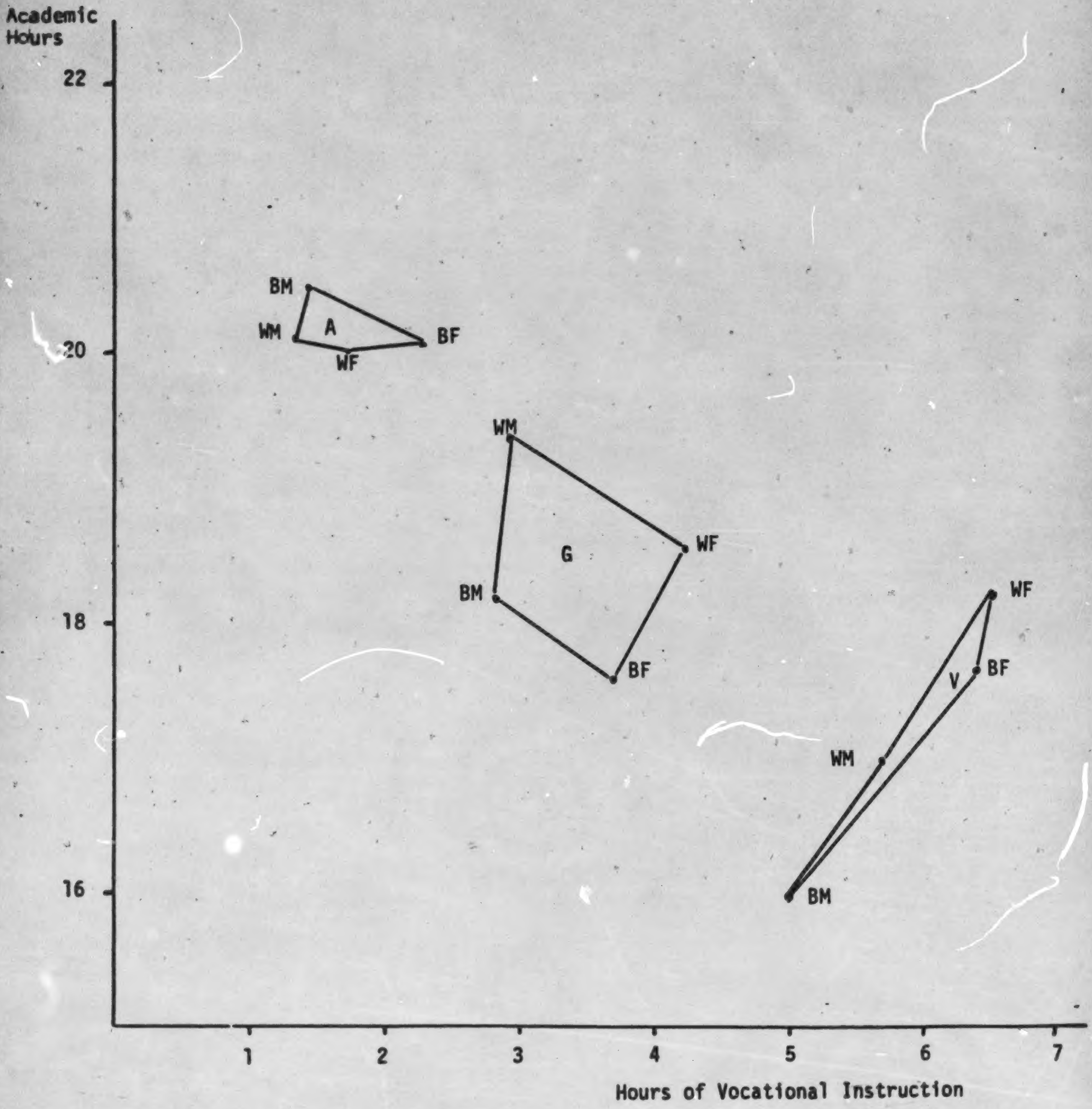
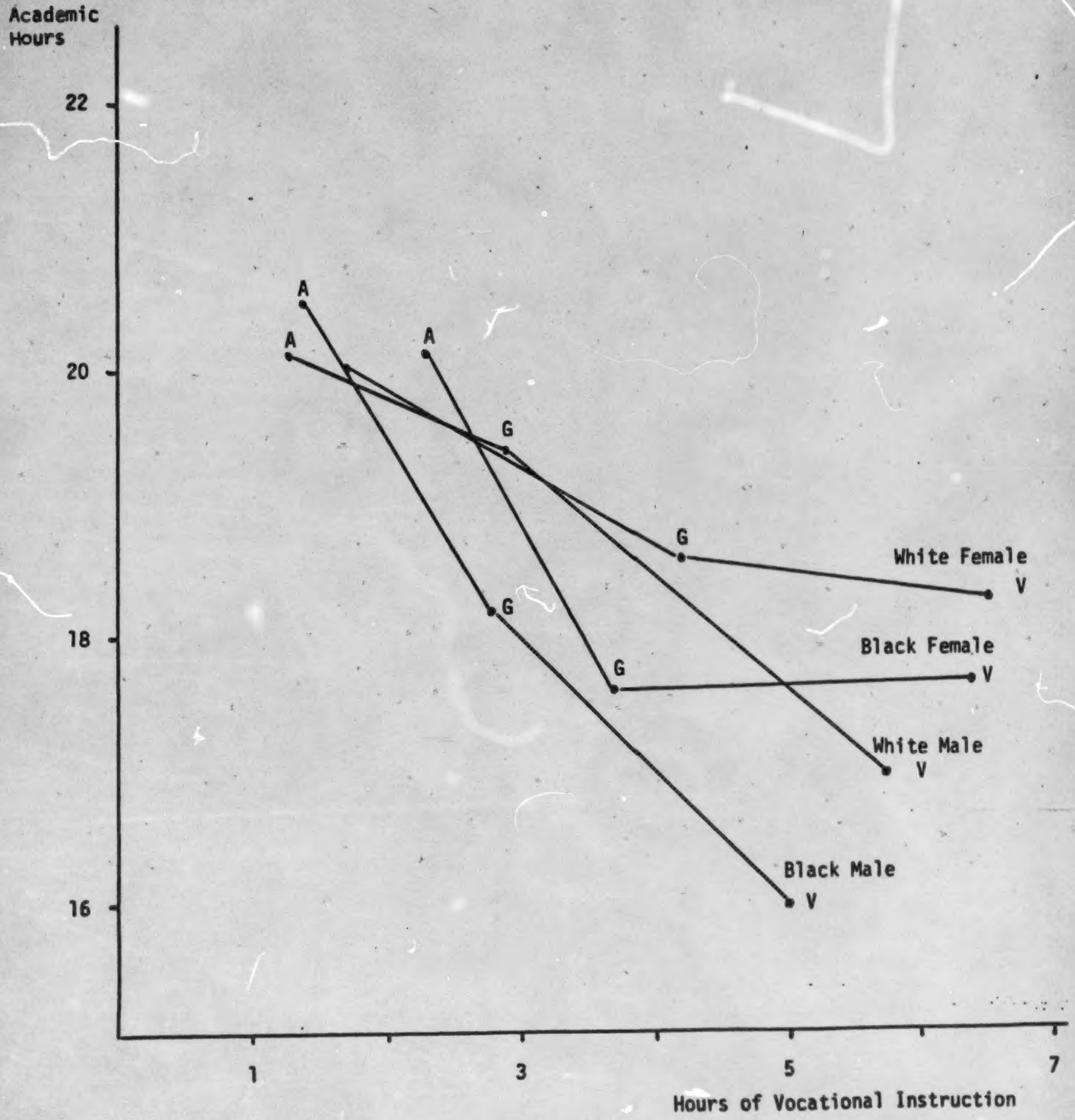


Figure 3.1B Hours of Academic and Vocational Instruction, by High School Program, Race and Sex, Version B.



sex (male, female). The alternative versions are graphed with race/sex groups linearly connected for each program (A) and the programs connected for each race/sex group (B). The first graph (A) clearly shows the program separations: None of the program figures are even remotely close to another. As one might expect, the hours of academic and vocational instruction are negatively related over programs, but not so across groups within programs. These negative relations are strongest for males, with females in academic and general curricula taking approximately equal amounts of academic instruction (B). In terms of total instruction, blacks are highest in the academic program, while whites are highest in the general. Within the vocational program, there is generally a positive relation of academic to vocational hours, white females ranking highest in both academic and vocational, followed by black females, white males and black males.

## 3.3 High School Work

In addition to instruction, high school students also work. Indeed, federal vocational education funds are expended so that work experience can be integrated with instruction (Cooperative Vocational Education) and so that disadvantaged pupils received enough income to remain in school (High School Work/Study). Thus, work experiences form an important aspect of a pupil's life while in high school.

The distribution of hours worked, by race and sex, is given in Table 3.11. There we see that black and female pupils are less often employed, while of those who worked, over forty percent of males and almost thirty percent of females were employed more than twenty hours per week. The mean hours per

Table 3.11 Hours Worked in High School, by Race and Sex.

| | Percent in Various Work Categories | | | |
|---|---|---|---|---|
| | White | | Black | |
| Hours Worked* | Male | Female | Male | Female |
| None | 21.0 | 30.6 | 36.5 | 47.6 |
| 10 or Less | 20.5 | 23.7 | 21.8 | 25.0 |
| 11 to 20 | 22.9 | 25.4 | 15.5 | 12.8 |
| 21 to 30 | 21.0 | 14.5 | 13.7 | 8.8 |
| More than 30 | 14.6 | 5.8 | 12.6 | 5.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |
| Of those who worked, percent working more than 20 hours | 45.1 | 29.3 | 41.2 | 27.9 |

*See Appendix E for the definition of the estimate used here and in subsequent tables.

week, by social background and high school curriculum are given in Table 3.12.

Table 3.12 Mean Hours Worked in High School, by High School Program, Father's Education, Race and Sex.

| High School Program | Father's Education | White | | Black | |
|---|---|---|---|---|---|
| | | Male | Female | Male | Female |
| Total | Total | 15.83 | 11.36 | 11.98 | 7.96 |
| Total | Total (of those working) | 20.04 | 16.37 | 18.87 | 15.19 |
| General | Total | 16.97 | 11.28 | 12.20 | 7.47 |
| Academic | Total | 13.41 | 10.28 | 9.92 | 7.18 |
| Vocational | Total | 19.95 | 13.46 | 13.88 | 10.22 |
| Total | Less than High School | 17.49 | 11.29 | 11.86 | 7.99 |
| Total | High School Graduate | 16.20 | 11.79 | 11.94 | 7.85 |
| Total | College Graduate | 12.75 | 10.34 | 11.74 | 8.91 |
| General | Less than High School | 18.00 | 10.50 | 11.83 | 7.50 |
| | High School Graduate | 16.91 | 11.59 | 12.69 | 7.48 |
| | College Graduate | 15.18 | 12.04 | 11.31 | 6.96 |
| Academic | Less than High School | 14.78 | 9.88 | 11.18 | 7.19 |
| | High School Graduate | 14.13 | 10.83 | 8.51 | 6.76 |
| | College Graduate | 11.37 | 9.60 | 10.94 | 8.70 |
| Vocational | Less than High School | 19.60 | 12.95 | 13.25 | 10.00 |
| | High School Graduate | 20.20 | 13.99 | 14.80 | 10.48 |
| | College Graduate | 20.16 | 12.41 | 13.64 | 18.44 |

Generally, males and whites work more hours than females or blacks. Some of these differences -- especially the racial ones -- are greatly diminished, however, if we restrict ourselves to those who engage in any work at all.

One of the most salient aspects of the table is the large number of work hours for high school pupils in 1972. Each of the groups, except black females, averages over ten hours of work each week and the males who work average about twenty hours per week. These amounts vary considerably by high school program: Vocational pupils working most, followed by those in the general curriculum, with academic enrollees working least. Social background seems to have little effect on work hours -- at least as measured by father's educational level. The only exception to this lack of effect is for white males, and even for this group it is restricted primarily to lowering work hours for pupils in the academic program whose fathers graduated from college.

Other effects on amount of work could come about via participation in special, federally-funded programs. Many of these programs could be expected to relate to amount of work either directly because of intent (Cooperative Vocational Education, Work/Study) or indirectly, because of selection criteria or emphasis on academic rather than work activities. Table 3.13 gives the participation rates in five such programs, by race and sex. There we see that the two vocation-related programs are those most frequently reported by the respondents. However, it is the other three programs which have the greatest racial differential in participation: each reporting larger black rates of participation.

Table 3.13 Percent Participation in Federal Programs, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Program | Male | Female | Male | Female |
| Upward Bound | 0.4 | 0.4 | 1.1 | 3.4 |
| Cooperative Vocational Education | 5.0 | 5.5 | 5.0 | 5.7 |
| High School Work Study | 4.0 | 4.0 | 4.4 | 6.9 |
| Talent Search | 0.4 | 0.3 | 1.7 | 3.1 |
| Neighborhood Youth Corps | 1.2 | 1.3 | 7.6 | 12.2 |

Average Hours of Work, by Program participation categories are given in Table 3.14. Project Upward Bound seems to increase work hours for black males, but this could be the result of program selection criteria. Both Cooperative Vocational Education and Work/Study programs, as one would expect, materially increase hours of work. These increases range from more than 50 percent to over 200 percent, depending on the racial/ethnic group or sex of the pupil. Talent Search seems to identify pupils who work somewhat less, and the Neighborhood Youth Corps has, at most, small and mixed effects.

**Table 3.14** Mean Hours of High School Work, by Program Participation, for Each Race and Sex Group.

| | PROGRAM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Racial/Ethnic Sex Group | Upward Bound | | Cooperative Vocational Education | | Work/Study | | Talent Search | | Neighborhood Youth Corps. | |
| | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. |
| White - Male | 15.00 | 15.66 | 24.41 | 15.25 | 23.43 | 15.37 | 12.88 | 15.67 | 14.15 | 15.68 |
| - Female | 11.72 | 11.37 | 20.60 | 10.89 | 17.61 | 11.15 | 7.88 | 11.38 | 11.13 | 11.35 |
| Black - Male | 14.64 | 11.97 | 17.57 | 11.64 | 17.83 | 11.77 | 8.32 | 12.04 | 10.50 | 12.08 |
| Female | 8.05 | 7.69 | 15.45 | 7.29 | 14.99 | 7.17 | 10.12 | 7.58 | 9.96 | 7.43 |

## 3.4 Work and Its Relation to Instruction

Generally, pupils in vocational programs have more instruction and work more than those in other curricula (Figures 3.2A and 3.2B), but this varies widely over groups (A). Across curricula, there is a straightforward positive relation between instructional and work hours for whites, although this relation is much stronger for males than females, because of greater work hours and less instructional variation in the male group. On the other hand, the relation is less straightforward for blacks, the contrast of general and vocational programs exhibiting a positive relation and the contrast of academic and general exhibiting a negative one (B).

To understand these gross results, we must refine our analysis of course exposure by separating it into narrower subcategories. Work hours exhibit great differentials in their relation to instruction (Table 3.15). If we relate, for white males, total vocational instruction to work, we find that pupils who do not work have, on the average, about two hours of vocational instruction per week. On the other hand, pupils who work more than 30 hours per week have about three and one-half hours of such instruction in a typical week. This is a 75 percent difference. Total academic hours of instruction displays a non-linear relation to work: such instructional hours being greatest for those who work ten or fewer hours, but diminishing for greater amounts of work. This pattern is caused by the heterogeneity of the academic classification: Industrial Arts and Commercial instruction resembling vocational instruction in their relations to work hours but the more stringent academic subjects (Mathematics, Science, Foreign Language), showing a straightforward negative relation. These latter relations are exhibited in graphic form in Figure 3.3.

**Figure 3.2A** Hours of Work and Instruction, by High School Program, Race and Sex, Version A.

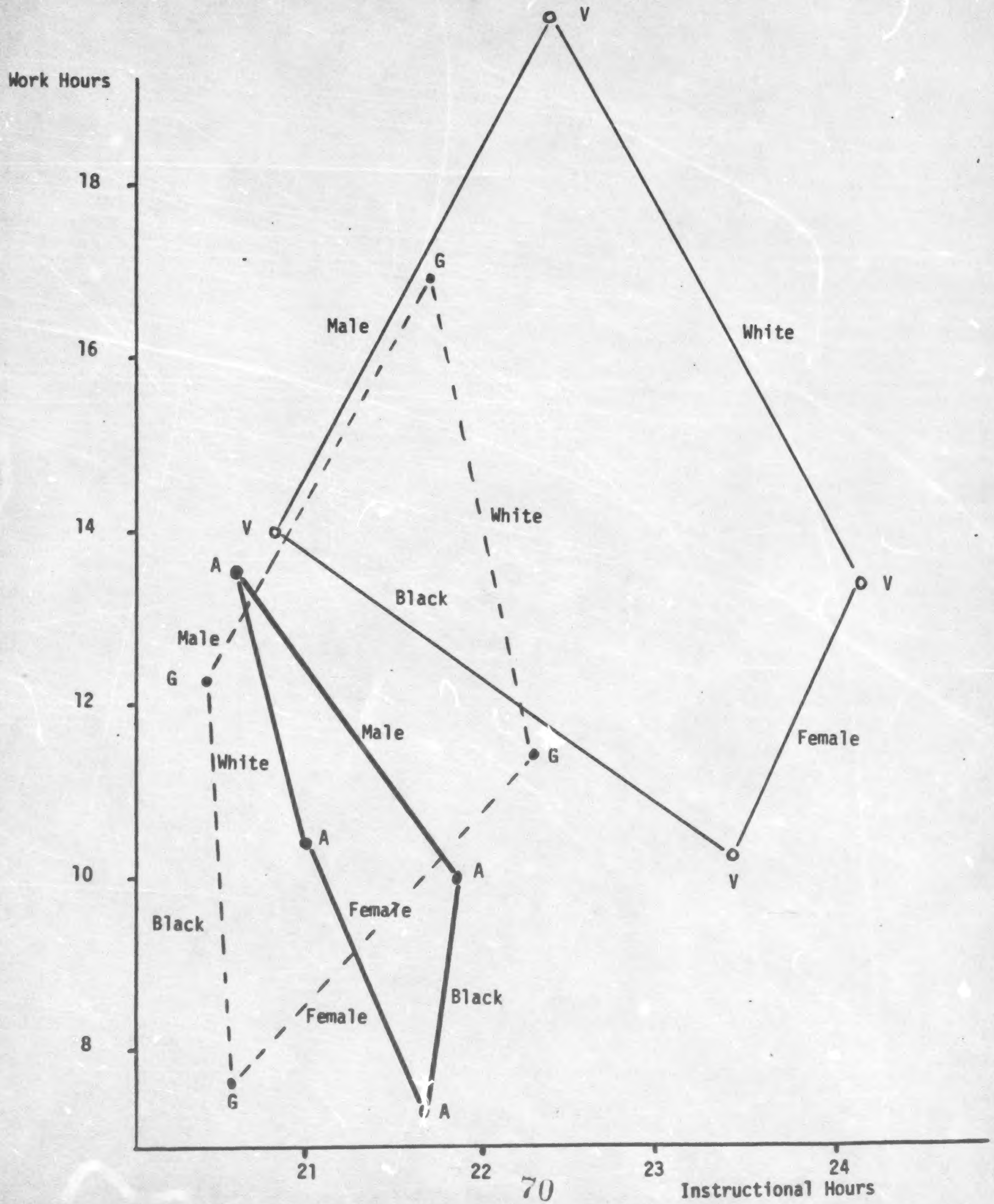


Figure 3.2B Hours of Work and Instruction, by High School Program, Race and Sex, Version B.

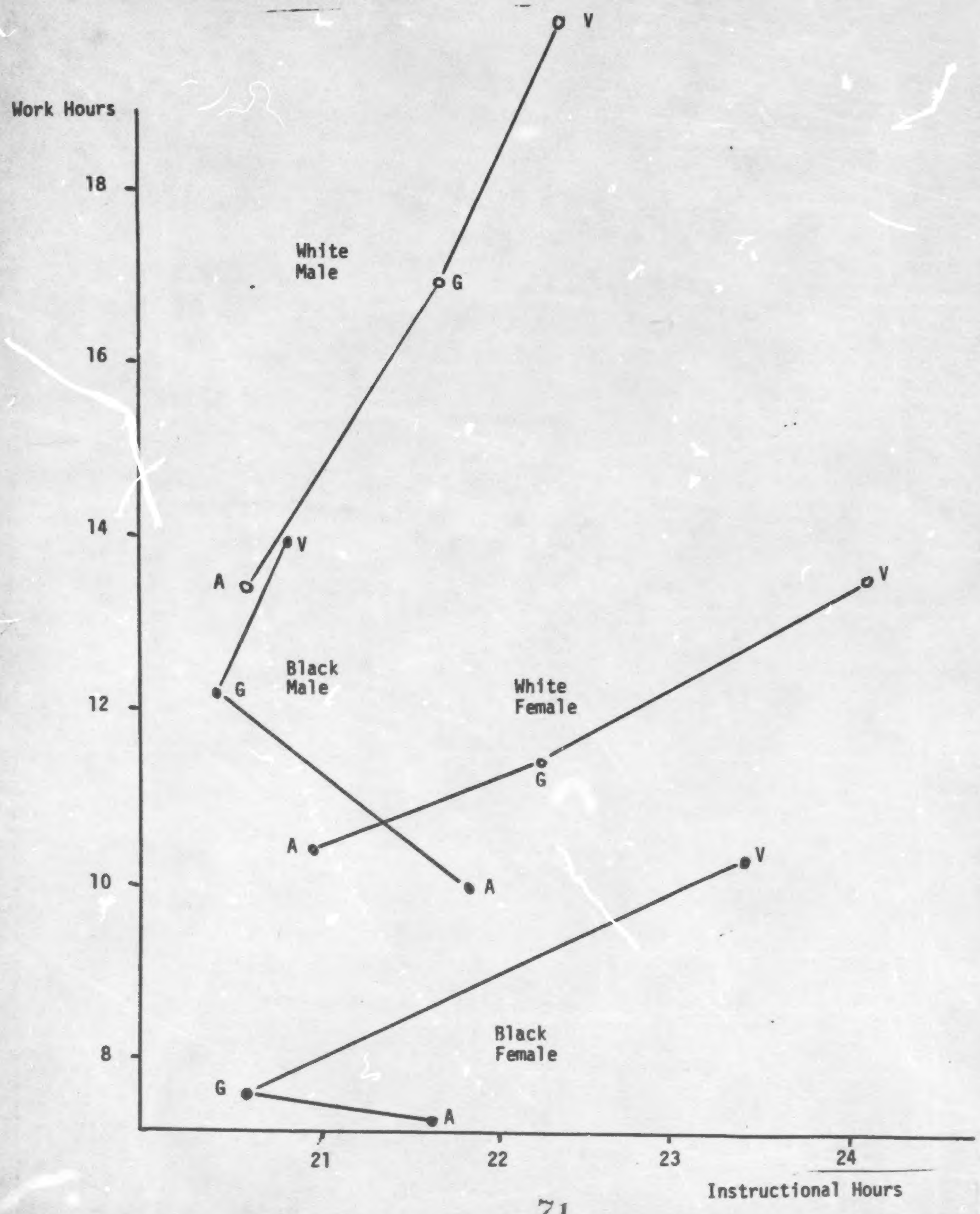
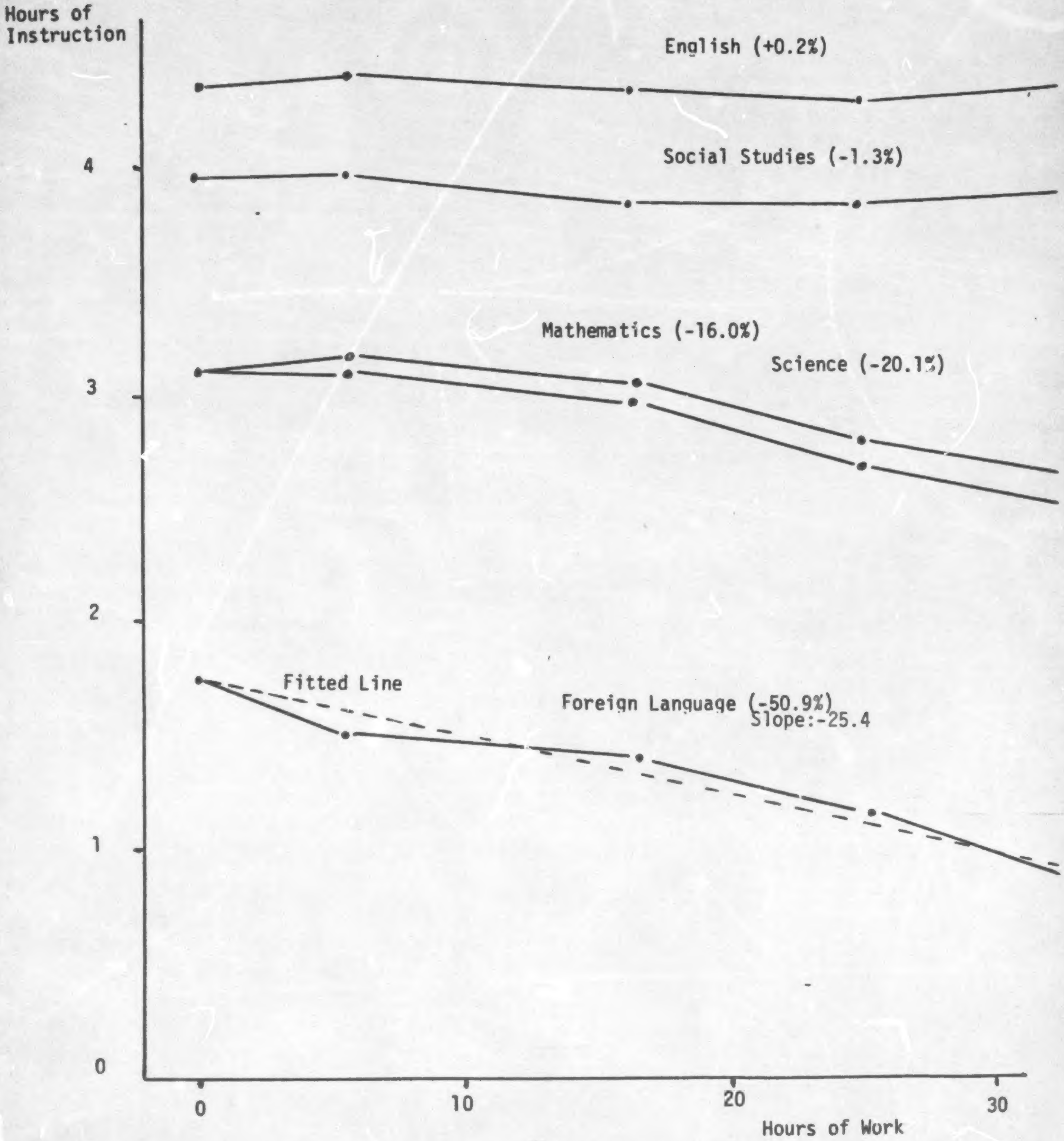


Table 3.15 Hours of Instruction, by Curricular Area and Hours of Work for White Males.

| | Work Hours | | | | |
|---|---|---|---|---|---|
| Area | None | 1 - 10 | 11 - 20 | 21 - 30 | More than 30 |
| Science | 3.09 | 3.10 | 2.97 | 2.71 | 2.47 |
| Foreign Language | 1.75 | 1.52 | 1.39 | 1.16 | 0.86 |
| Social Studies | 3.93 | 3.96 | 3.83 | 3.83 | 3.88 |
| English | 4.36 | 4.41 | 4.35 | 4.32 | 4.37 |
| Mathematics | 3.12 | 3.16 | 3.07 | 2.80 | 2.62 |
| Industrial Arts | 1.30 | 1.43 | 1.48 | 1.90 | 1.97 |
| Commercial | 1.01 | 1.16 | 1.17 | 1.19 | 1.15 |
| Arts | 1.06 | 1.24 | 1.03 | 0.87 | 0.89 |
| Total Academic | 18.46 | 19.43 | 18.40 | 17.98 | 17.72 |
| Agriculture | 0.15 | 0.25 | 0.27 | 0.39 | 0.50 |
| Business | 0.73 | 0.85 | 0.83 | 0.86 | 0.87 |
| Distributive Education | 0.03 | 0.03 | 0.76 | 0.19 | 0.29 |
| Health Occupations | 0.04 | 0.06 | 0.37 | 0.04 | 0.05 |
| Home Economics | 0.07 | 0.08 | 0.08 | 0.08 | 0.09 |
| Trade or Industrial | 1.01 | 1.15 | 1.25 | 1.55 | 1.69 |
| Total Vocational | 2.04 | 2.43 | 2.54 | 3.11 | 3.49 |
| Total | 21.66 | 22.42 | 21.84 | 21.86 | 21.71 |
| Mean Work Hours | 0.00 | 5.97 | 16.52 | 25.42 | 35.00 |

Figure 3.3 Hours of Instruction in English, Social Studies, Mathematics, Science, and Foreign Languages, as a Function of Hours of Work for White Males.



Clearly, there is little relation of English and Social Studies instruction and the level of work in high school. Presumably, these offerings are such a constant curricular requirement that little variation is possible. The amount of Mathematics instruction for those who work more than 30 hours, however, is 16 percent less than for the non-employed. Similarly it is 20 percent less in Science and 51 percent less in Foreign Language. These extreme relations for Mathematics, Science and Foreign Language instruction have important implications for policies concerning work/study and other programs which support pupil work experience in high school. If these relations hold for blacks and females as well as white males, work experience could have detrimental indirect effects on later access to high status occupations and subsequent career patterns. To explore this we have focussed on Foreign Language instruction, accounting the relationships between instructional hours in this area and work hours.

In Figure 3.3, above, in addition to the mean values of Foreign Language instruction, there is a line which smooths this jagged observed relation. This line is a regression line fitted by means of a least squares analysis of the overall relation of Foreign Language instruction to work hours for white male pupils. This analysis was repeated for blacks and females and for these subgroups by high school curriculum (General, Academic, Vocational). The summary statistics for these analyses are given in Appendix Table D2. Table 3.16 summarizes the results of these analyses, by tabulating the fitted (estimated) mean values of Foreign Language instructional hours for non-employed (zero work hours) pupils and for those who worked more than thirty hours, together with the percentage difference in these figures.

**Table 3.16** Estimated Mean Hours Per Week of Instruction in Foreign Language for Pupils Who Worked 30 Hours and for Pupils Who Did Not Work, by Race, Sex and High School Program.*

| | White | | Black | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| **All Programs** | | | | |
| 0 Hours | 1.75 | 1.74 | 0.97 | 1.14 |
| 30 Hours | 1.01 | 1.47 | 0.68 | 1.14 |
| Percent Difference | -42.0 | -15.7 | -12.0 | - 0.7 |
| **General Programs** | | | | |
| 0 Hours | 0.97 | 0.86 | 0.54 | 0.71 |
| 30 Hours | 0.71 | 1.00 | 0.57 | 0.75 |
| Percent Difference | -27.2 | +16.0 | + 5.8 | + 4.8 |
| **Academic Programs** | | | | |
| 0 Hours | 2.38 | 2.63 | 2.24 | 2.27 |
| 30 Hours | 1.87 | 2.48 | 1.69 | 2.59 |
| Percent Difference | -21.6 | - 5.7 | -24.6 | +15.7 |
| **Vocational Programs** | | | | |
| 0 Hours | 0.31 | 0.61 | 0.30 | 0.51 |
| 30 Hours | 0.30 | 0.72 | 0.20 | 0.63 |
| Percent Difference | - 3.9 | +18.1 | -32.8 | +23.4 |

*Refer to Appendix Table D.2 for the regression summary statistics used in computing the entries in this table.

Generally, the relationship between hours of work and hours of Foreign Language instruction is negative. However, the relationship is much less strong for blacks and females than for white males, and it essentially disappears for black females.

Examining the relations for each program separately, it becomes clear that much of the general relation is due to variations across curricula. I.e., relations are generally smaller or are even positive within program groups. For example, within the academic program, the negative relation holds for males but only marginally for white females and is positive for black females. The same general pattern holds for those in vocational curricula: negative relations for males, positive ones for females; although the negative relation is weakest there for white males. Enrollees in the general program exhibit small marginally positive relations for blacks, a moderate positive relation for white females and a strong negative relation for white males. Overall, comparisons of groups within programs yield positive relations for females and negative ones for males, suggesting that the dynamics of academic course taking and work experience may be substantially different for males and females.

To generalize beyond the example, we have tabulated the correlations among total instructional hours, academic hours, vocational hours, and work hours, by racial/ethnic group, sex and program (Table 3.17). In general, even after accounting for the effects of cross-program differences, total instructional hours and work hours are negatively related (D). Ten out of the twelve relevent correlations are negative and the two positive correlations are for black females, giving weak support for the earlier found sex difference. Academic and vocational Hours are uniformly positively correlated within curricula. Recalling that the predominate and strong relation between academic and vocational hours across curricula is negative, and that the parallel relation between work and total instruction is primarily positive, it becomes very clear that students within a particular curriculum exhibit opposite relations. I.e., they tend to trade off schooling for work but do not trade off vocational for academic courses;

**Table 3.17** Correlations Among Total Instructional Hours, Academic Instructional Hours, Vocational Instructional Hours and Work Hours; by Race, Sex, and High School Program.

A. Academic versus Work Hours

| | White | | Black | |
|---|---|---|---|---|
| **Program** | **Male** | **Female** | **Male** | **Female** |
| General | -.073 | -.018 | -.084 | -.039 |
| Academic | -.105 | -.069 | .112 | -.111 |
| Vocational | -.050 | -.080 | .017 | .004 |
| Total | -.072 | -.066 | -.103 | .017 |
| B. Vocational versus Work Hours | | | | |
| **Program** | | | | |
| General | .088 | .006 | .037 | -.004 |
| Academic | .076 | .037 | .052 | .026 |
| Vocational | -.029 | -.002 | -.147 | .069 |
| Total | .155 | .078 | .027 | .069 |
| C. Academic versus Vocational Hours | | | | |
| **Program** | | | | |
| General | .182 | .145 | .140 | .097 |
| Academic | .198 | .264 | .206 | .356 |
| Vocational | .329 | .218 | .070 | .185 |
| Total Sample | .082 | .097 | -.007 | .140 |
| D. Total Instructional Hours versus Work Hours | | | | |
| **Program** | | | | |
| General | -.036 | -.025 | -.028 | -.053 |
| Academic | -.005 | -.021 | -.100 | .079 |
| Vocational | -.084 | -.052 | -.102 | .030 |
| Total Sample | -.014 | -.009 | -.068 | .024 |

in fact, they tend to take either more or fewer of both.* Thus, the total relations among these pursuits are not directly interpretable; they confuse structural relations across the curricula with individual-level relations within them. And therefore they profoundly mix up the impact of the processes which allocate pupils to (select pupils into) high school programs on pupils' educational and work experiences, with the impact of the family constraints and pupils' individual choices on these experiences.

Breaking down total instruction into its academic and vocational components, and then relating them to work hours, we see that the primary -- within curriculum -- component contributing to the total negative relation for whites is the relation between work and academic hours. This sub-relation is uniformly negative for whites while it is mixed for blacks (perhaps negative for males, perhaps positive for females). The vocational hours/work hours relation is primarily positive for general and academic curricula and weakly negative for vocational (four out of twelve correlations negative). Thus, the major part of the tradeoff for whites in non-vocational curricula is between academic courses and work, while for whites in vocational curricula, more work means fewer courses in both academic and vocational areas. These results hold in the main, but not as strongly, for black males and relations are weaker and more scattered for black females.

---

*We have also investigated the variance and stability of these relations over social background differences. Control for such differences has almost no effect on the size and magnitude of the correlations.

## 3.5 Hours of Academic Instruction, Vocational Instruction and Work: A Summary of Differences

Academic instruction averages about eighteen hours per week in the last three years of high school, but blacks lag about four to five percent behind whites (perhaps as much as an hour). Social background has very little effect on current academic instruction independent of program. That is, social background has its primary effect on hours of academic instruction via the process by which pupils are selected for particular programs. Program differences (Academic minus Vocational, see Table 3.18) range from two to three hours (12 to 18% of the vocational means), but are greatest for black males (4½ hours or 29% of the vocational mean). In standard deviation terms, these differences average about 40 percent, but are only 25 percent of that value for white females and are 75 percent for black males. Thus, program differences in academic instruction are very large, especially for black males, and vary considerably across groups.

Table 3.18 Academic/Vocational Program Contrasts* in Hours Per Week of Work, Academic and Vocational Training, by Race and Sex.

| | White Male | White Female | Black Male | Black Female |
|---|---|---|---|---|
| **Academic Hours** | | | | |
| Raw Contrast (Hours) | 2.91 | 1.67 | 4.58 | 2.37 |
| Standard Deviation (Hours) | 6.63 | 6.61 | 6.14 | 6.59 |
| Percent Contrast (% of SD) | 43.9 | 25.3 | 74.6 | 36.0 |
| Percent of Vocational Mean | 17.7 | 9.5 | 28.9 | 13.9 |
| **Vocational Hours** | | | | |
| Raw Contrast (Hours) | - 4.42 | - 4.78 | - 3.61 | - 4.12 |
| Standard Deviation | 3.21 | 3.71 | 3.14 | 3.75 |
| Percent Contrast (% of SD) | -137.7 | -128.8 | -115.0 | -109.9 |
| Percent of Vocational Mean | - 77.8 | - 73.5 | - 72.1 | - 64.3 |

Table 3.18 Continued

| Work Hours | White Male | White Female | Black Male | Black Female |
|---|---|---|---|---|
| Raw Contrast (Hours) | - 6.54 | - 3.18 | - 3.96 | - 3.04 |
| Standard Deviation | 12.18 | 10.77 | 12.56 | 10.69 |
| Percent Contrast (% of SD) | - 53.7 | - 29.5 | - 31.5 | - 28.4 |
| Percent of Vocational Mean | - 32.8 | - 23.6 | - 28.5 | - 29.8 |
| Percent in Excess of White Males | | | | |
| Academic Hours | 0 | 0.2 | - 3.9 | - 5.1 |
| Vocational Hours | 0 | 20.5 | 12.7 | 37.3 |
| Work Hours | 0 | - 28.2 | - 24.3 | - 49.7 |

*Academic Hours - Vocational Hours/Total Standard Deviation.

The difference for black males is worth emphasizing. They are greatly separated in amount of academic training depending on whether they are in the academic or vocational track. The reason for this is that they are exposed to more academic course work than white males if they are in the academic program. On the other hand the white females are not widely separated in the amount of academic course work by program participation. This occurs primarily because they receive more academic exposure than white males when they are in a vocational program.

Vocational Instruction averages about three hours per week in the last three years of high school. Overall, black males generally get more vocational training than white males (+13%), but less if they are in the general (-4%) or vocational (-12%) programs. They are exposed to more vocational instruction than white males (+11%) if they are in the academic program. Thus, the primary reason for their greater amount of vocational instruction is the fact that they are proportionately more often than whites selected for vocational curricula. The females get more vocational instruction regardless of programs. But the largest differences, both racial and between the sexes, are in the academic program and the smallest are in the vocational.

Work during high school averages about thirteen hours per week, but varies considerably over race and sex groups (7½ hours for black females to 16 hours for white males). Generally, females work less than males (-34% for whites) and blacks than whites (-28% for males). In relative (to standard deviation) terms, average work hours vary over programs (-28% to -54% of a standard deviation, academic vs. vocational) almost as much as academic hours (+25% to +75% of a standard deviation, academic vs. vocational). But in proportional terms, they vary more (the work mean for the academic program is 24% to 47% less than the work mean for the vocational program; while the academic hours mean for the academic program is only 10% to 29% greater than the academic hours mean for the vocational program). Because blacks work so much less than whites, the program separation in work hours is relatively greater for white males (6½ hours or 54% of a standard deviation) than for black males (4 hours or 31% of a standard deviation), although in proportionate terms (academic program means as a percent of vocational), it is similar (-33% for white males, -29% for black males).

## 3.6 The Allocation of Instructional Resources: Vocational Education

The patterns of experience which we have just discussed can be expressed from an alternative viewpoint. As we have chosen to develop them, and they are reppresented by averages of indices of pupil experience, and are most meaningful from the prospective of the pupil. From the perspective of the educational instruction providing services which contribute to those experiences, however, these averages do not correspond to the efforts expended nor to their distribution over relevant groups of pupils.

For example, suppose that pupils in vocational programs constituted 24 percent of all pupils and, therefore, pupils in non-vocational programs (academic, general) constituted 76 percent of all pupils. Suppose also that pupils in vocational programs received about 6.1 hours per week of vocational instruction, while pupils in non-vocational programs received only 2.6 hours of vocational instruction. Then, the total proportion of the instructional hours expended by the schools which went to vocational-program pupils would be:

$$\frac{(6.1)(.24)}{(6.1)(.24) + (2.6)(.76)} \cong 0.43$$

I.e., even though the rate of service received by vocational pupils was over twice the rate of receipt by non-vocational pupils [(6.1)/(2.6) $\cong$ 2.4], the fact that non-vocational pupils constituted more than three-fourths of the total population implied that they -- as a group -- received well over half (57%) of the instruction conveyed.

This result is, in fact, approximately correct. I have simplified the computation so that the concept is made clear and consequently the figures have been severely rounded. Below, we carry out these computations more accurately for a more finely segmented set of pupil sub-groupings. These sub-groupings are defined by the racial/ethnic group; sex, and curricular program of the pupil. And in order to accomplish the complete accounting of vocational instructional services delivered, we must expand our scope to include all pupils, not just whites and blacks.

Table 3.19 exhibits the total vocational hours of instruction for which pupils were registered over the last three years of high school. As before, these hours are expressed on a per week basis. Vocational pupils, in total, average -- as we indicated above -- about 6.1 hours per week. Pupils in the general program average about 3.5 hours and academic pupils about 1.9 hours.* Blacks average about 3.6 hours, over-all programs, and whites about 3.2 hours. Females average 3.7 hours and males average 2.8 hours, a twenty-five percent difference.

---

*These figures are consistent with and may be (partially) found in Appendix D.

Table 3.19 Mean Hours of Vocational Instruction, by Racial/Ethnic Group, Sex, and High School Program.

| | Program | | | |
|---|---|---|---|---|
| Subgroups | General | Academic | Vocational | Total (All Programs) |
| **Males** | | | | |
| White | 2.94 | 1.26 | 5.68 | 2.68 |
| Black | 2.81 | 1.40 | 5.01 | 3.02 |
| Other | 3.54 | 1.41 | 5.69 | 3.37 |
| Total (All Males) | 2.98 | 1.34 | 5.62 | 2.76 |
| **Females** | | | | |
| White | 4.22 | 1.72 | 6.50 | 3.63 |
| Black | 3.67 | 2.29 | 6.41 | 4.00 |
| Other | 4.05 | 2.14 | 6.68 | 4.11 |
| Total (All Females) | 4.11 | 1.79 | 6.50 | 3.70 |
| **Total** | | | | |
| White | 3.51 | 1.46 | 6.14 | 3.15 |
| Black | 3.29 | 1.92 | 5.80 | 3.58 |
| Other | 3.81 | 1.45 | 6.14 | 3.72 |
| Total (All Subgroups) | 3.51 | 1.93 | 6.11 | 3.23 (All Pupils) |

Table 3.20 displays the percentage of the total pupil population on which these means are based. We have here departed from our usual practice of using the proportions exhibited in Table 2.2 for computations and for the purpose of computing instructional service distributions will use the figures in Table 3.20. The logic behind this modification of our general strategy is that the information about the pupil's high school program was obtained on the same

survey instrument as the course-taking information. As the major comparisons of the resource allocation programs are across programs -- in total -- and, across race and sex groups within programs, and especially as they are with the corresponding population composition programs, we believe that the resource allocation conclusions are more accurately drawn using the stratification proportions excluding missing data on both program and course-taking. So that, identical pupils are used for all elements of the computation. As can be seen from a comparison of Table 2.2 with Table 3.20, the actual discrepancies in the proportions used are, in any case, not large enough to produce large differences in the estimated allocations.

Table 3.20 Percent Population Distribution, Over Racial/Ethnic, Sex, and High School Program Groups for Pupils with Complete Information on High School Programs and Course-Taking.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| Males | | | | |
| White | 12.9 | 20.5 | 8.7 | 42.1 |
| Black | 1.8 | 1.0 | 1.0 | 3.8 |
| Other | 1.4 | 1.5 | 1.2 | 4.1 |
| Total | 16.1 | 23.0 | 10.9 | 50.0 |
| Females | | | | |
| White | 10.5 | 19.8 | 11.0 | 41.3 |
| Black | 2.3 | 1.4 | 1.3 | 5.0 |
| Other | 1.6 | 1.1 | 1.0 | 3.7 |
| Total | 14.4 | 22.3 | 13.3 | 50.0 |
| Total | | | | |
| White | 23.4 | 40.3 | 19.7 | 83.4 |
| Black | 4.1 | 2.4 | 2.3 | 8.8 |
| Other | 3.0 | 2.6 | 2.2 | 7.8 |
| Total | 30.5 | 45.3 | 24.2 | 100.0 |

The final allocations of the vocational instructional services in percentage terms, are given in Table 3.21. This table was derived from the figures given in Tables 3.19 and 3.20 by using the computational logic discussed above. The figures, therefore, represent the percentages of the total instructional resources -- as they result in actual hours of vocational instruction allocated to pupils in various racial/ethnic, sex, and program groups. The figures in this table, in contrast to earlier tables of mean hours, actually sum to 100 percent and the marginal sums represent estimates of the resources allocated to the aggregate groups represented in that marginal classification.

Table 3.21 Percent of Vocational Instructional Resources Allocated to Various Racial/Ethnic, Sex and High School Program Groups.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| **Males** | | | | |
| White | 11.70 | 7.97 | 15.30 | 34.97 |
| Black | 1.56 | 0.42 | 1.53 | 3.51 |
| Other | 1.53 | 0.64 | 2.10 | 4.27 |
| Total | 14.79 | 9.03 | 18.93 | 42.75 |
| **Females** | | | | |
| White | 13.71 | 10.52 | 22.06 | 46.29 |
| Black | 2.58 | 0.99 | 2.63 | 6.20 |
| Other | 1.99 | 0.72 | 2.06 | 4.77 |
| Total | 18.28 | 12.23 | 26.75 | 57.26 |
| **Total** | | | | |
| White | 25.41 | 18.49 | 37.36 | 81.26 |
| Black | 4.14 | 1.41 | 4.16 | 9.17 |
| Other | 3.52 | 1.36 | 4.16 | 9.04 |
| Total | 33.07 | 21.26 | 45.68 | 100.00 |

We first note a confirmation of our earlier, rough, result: Vocational pupils receive less than 50 percent of the resources devoted to vocational instruction (46%). And of the 54 percent allocated to pupils not in vocational programs, two-thirds go to pupils in the general curriculum (33%) and one-third to those enrolled in academic programs (21%). We also see that 81 percent of the resources go to white pupils, 10 percent to blacks, and 9 percent to those in other racial/ethnic groups. This is roughly equivalent to the total population percentages of 83, 9, and 8 percent, respectively. (See below, Table 3.23 for a more precise comparison.) Females receive 57 percent of these allocated resources as opposed to 43 percent for males. This can also be compared, with some meaning to Table 2.8, where the composition of vocational program enrollments was found to be: White - 80 percent, black - 11 percent, other - 10 percent; females - 56 percent and males - 44 percent.

For this specific population (i.e., accounting missing data), the corresponding percentages are: white - 81 percent, black - 10 percent, other - 9 percent; female - 55 percent, male - 45 percent (see Table 3.24 below). Also, of the resources allocated to black pupils (9.7 percent of the total), even a smaller portion (43 percent) are allocated to those in vocational programs.

We now turn our attention specifically to a comparison of the resources allocated to a sub-group and the proportion of the population in that sub-group. Table 3.22 displays the percent differences between the resources allocated and the population proportion in each category, thus displaying the resource allocation against an expectation based on an equal allocation to each individual.* Here we see the resource targeting in sharp contrast: Vocational

---

*These figures were derived by taking ratios of the entries in Tables 3.20 and 3.21.

Table 3.22 Percent Discrepancy: Total Vocational Instructional Resources Allocated Versus Proportion of Pupils, by Racial/Ethnic, Sex and High School Program Group.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| **Males** | | | | |
| White | - 9.3 | -61.1 | + 75.9 | -16.9 |
| Black | -13.3 | -58.0 | + 53.0 | - 7.6 |
| Other | + 9.3 | -57.3 | + 75.0 | - 4.0 |
| Total | - 8.1 | -60.7 | + 73.7 | -14.5 |
| **Females** | | | | |
| White | +30.6 | -46.9 | +100.6 | +12.1 |
| Black | +12.2 | -29.3 | +102.3 | +24.0 |
| Other | +24.4 | -34.6 | +106.0 | +28.9 |
| Total | +26.9 | -45.2 | +101.1 | +14.5 |
| **Total** | | | | |
| White | + 8.6 | -54.1 | + 89.6 | - 2.6 |
| Black | + 1.0 | -41.3 | + 80.9 | +10.3 |
| Other | +17.3 | -47.7 | + 89.1 | +15.9 |
| Total | + 8.4 | -53.1 | + 88.8 | 0.0 |

pupils receive 89 percent more vocational resources than they would under an artificial expectation of proportionate allocations over high school programs. Pupils in the general program receive 8 percent more and those in academic programs 53 percent less than that expectation. Females receive about 15 percent fewer resources than under proportionate allocation. Whites receive about three percent fewer resources and black and other racial/ethnic groups receive 10 and 16 percent more, respectively.

The allocation comparisons we have been discussing have been primarily influenced by differences among programs, either in the general amount of resoures allocated or in the expectations with which we compared them. Thus, when we found that over fifty percent of the vocational instructional revenues were allocated to non-vocational pupils, we implicitly compared that to a value based on the expectation that all or the vast majority of vocational education resoures should flow to those enrolled in vocational programs. However, when we made the comparisons of sex and racial/ethnic groups based on Table 3.22, we posited equal allocations to individuals as the expectational base. In actual fact, however, we would not expect that allocations should flow equally to sex and racial/ethnic groups, because they are unevenly distributed over high school programs and we do not expect that vocational resources should be distributed proportionately over programs even if pupils were so distributed. Surely under any reasonable expectation, vocational students should have a higher rate of exposure to such resources than non-vocational students. One useful way to handle this problem is to examine resource allocation within programs. This does not address the issue of allocation by program enrollment category, but that issue has already been adequately handled by the initial results.

Table 3.23 displays proportional resource allocations to racial/ethnic and sex groups by high school program. This table was produced by column-standardizing Table 3.21. Table 3.24 was produced in a corresponding fashion from Table 3.20, yielding the percentage composition of each program group, separately.

Table 3.23 Percent of Vocational Instructional Resources Allocated to Various Racial/Ethnic and Sex Groups, by High School Program.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| **Males** | | | | |
| White | 35.38 | 37.49 | 33.49 | 34.97 |
| Black | 4.72 | 1.98 | 3.35 | 3.51 |
| Other | 4.63 | 3.01 | 4.60 | 4.27 |
| Total | 44.72 | 42.47 | 41.44 | 42.75 |
| **Females** | | | | |
| White | 41.46 | 49.48 | 48.29 | 46.29 |
| Black | 7.80 | 4.66 | 5.76 | 6.20 |
| Other | 6.02 | 3.39 | 4.51 | 4.77 |
| Total | 55.28 | 57.53 | 58.56 | 57.26 |
| **Total** | | | | |
| White | 76.84 | 86.97 | 81.79 | 81.26 |
| Black | 12.52 | 6.63 | 9.11 | 9.71 |
| Other | 10.64 | 6.40 | 9.11 | 9.04 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 |

Table 3.24 Percent Population Distribution Over Racial/Ethnic and Sex Groups, by High School Program.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| **Males** | | | | |
| White | 42.3 | 45.3 | 36.0 | 42.1 |
| Black | 5.9 | 2.2 | 4.1 | 3.8 |
| Other | 4.6 | 3.3 | 5.0 | 4.1 |
| Total | 52.8 | 50.8 | 45.0 | 50.0 |
| **Females** | | | | |
| White | 34.4 | 43.7 | 45.5 | 41.3 |
| Black | 7.5 | 3.1 | 5.4 | 5.0 |
| Other | 5.3 | 2.4 | 4.1 | 3.7 |
| Total | 47.2 | 49.2 | 55.0 | 50.0 |
| **Total** | | | | |
| White | 76.7 | 89.0 | 81.4 | 83.4 |
| Black | 13.4 | 5.3 | 9.5 | 8.8 |
| Other | 9.8 | 5.7 | 9.1 | 7.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

Given these data, we may then compare the two tables and estimate program-specific discrepancies (Table 3.25). Here we see the implications of the resource allocations much more clearly. In addition to being more often assigned to vocational programs than males, females in any specific program are allocated proportionately more vocational resources than the males in the same program. Thus females are allocated additional vocational instructional resources via both program selection and course enrollment. Interestingly, however, the within-program resource allocations are more sex related in the general

Table 3.25 Percent Discrepancy: Vocational Instructional Resources Allocated Versus Proportion of Pupils, by Racial/Ethnic and Sex Group, for Each High School Program.

| | Program | | | |
|---|---|---|---|---|
| Sub-Group | General | Academic | Vocational | Total |
| **Males** | | | | |
| White | -16.4 | -17.2 | - 7.0 | -16.9 |
| Black | -20.0 | -10.0 | -18.3 | - 7.6 |
| Other | + 1.0 | - 8.9 | - 8.0 | - 4.0 |
| Total | -15.3 | -16.4 | - 7.9 | -14.5 |
| **Females** | | | | |
| White | +20.9 | +13.2 | + 8.3 | +12.1 |
| Black | + 4.0 | +50.3 | + 6.7 | +24.0 |
| Other | +13.6 | +51.3 | +10.0 | +28.9 |
| Total | +17.1 | +16.3 | + 6.5 | +14.5 |
| **Total** | | | | |
| White | + 0.1 | - 2.3 | + 0.5 | - 2.6 |
| Black | - 6.6 | +25.1 | - 4.1 | +10.3 |
| Other | + 8.6 | +12.3 | + 0.1 | +15.9 |
| Total | 0.0 | 0.0 | 0.0 | + 0.0 |

curriculum and in the academic curriculum than in vocational programs. In the non-vocational programs females receive 16 or 17 percent more resources than expectations based on proportionate allocations, while in vocational programs this discrepancy is only 7 or 8 percent.

Black pupils, on the other hand, receive quite different resource allocations depending on the program in which they are enrolled. Blacks in the academic curriculum receive proportionately more vocational resources than the other groups. However, in the general program they receive less, although the discrepancies are smaller. Blacks also receive fewer resources, relatively, if they are enrolled in vocational programs, although here the discrepancies are the smallest, paralleling the results for females.

To summarize, there are three main findings concerning the allocation of vocational instructional resources:

1. Pupils enrolled in non-vocational programs receive more of the resources devoted to vocational instruction than do pupils enrolled in vocational programs. This finding was forecast in Section 1 of this report when we found that large proportions of the course enrollments in particular vocational programs were from pupils not enrolled in those programs. Thus, this important finding is buttressed by data from completely independent sources. Surely, if the major intent of vocational education is, as is most often asserted, to prepare pupils for particular post-high school occupations and jobs, the fact that the majority of such resources do not flow to pupils enrolled in programs with these specific goals is worthy explicit discussion during the process of allocation of future resources to vocational education. This issue is especially salient during a period

of political debate over alternate ways of handling the high rate of unemployment among youth. If vocational education is a tool for reducing youth unemployment, we should be extremely confident that additional resources allocated to such occupationally-oriented programs are not diffused to youth who do not encounter unemployment problems either because they already have relevant job skills or because they go on to academic post-secondary education. And we should be doubly sure that the resources are allocated with sufficient intensity and depth to specific individuals so they are actually prepared to successfully enter the occupation for which they were trained.

2. Females received proportionately more vocational resources devoted to instruction than males. This conclusion should be treated with somewhat more caution than the first. Data displayed in Appendix D indicates that the differential in mean vocational course exposure by sex could be attributed solely to courses in Home Economics. As there is some ambiguity in the occupational nature of the courses in this area and as the 1972 data collection did not attempt to differentiate between the occupational and the personal nature of these courses, we are left with an ambigious result.

3. In academic programs, black pupils receive more vocational resources than others, while in vocational or general curricula blacks receive less than non-blacks. This finding essentially reinstates that of the earlier section dealing with exposure. This result is less tenuous than the one for females (2), however, because it is paralleled in both male and female course exposure and resource allocation data.

## 3.7 Academic Achievement and High School Program

Academic achievement of the high school seniors in different academic programs varies considerably. Table 3.26 displays means of test scores in Mathematics, Reading Comprehension, and Vocabulary by race, sex, father's education, and high school program. Of the four factors tabulated, race and high school program exhibit the largest variations in achievement; sex and father's education being minor sources by comparison. It appears as if the usual strong relation of social background to test performance is mainly absorbed here in high school programs and racial differences. Even in the absence of achievement data for the beginning high school years it seems safe to assume that a considerable portion of these differences among programs existed in the form of earlier achievement differences which contributed to the selection criteria for program enrollment. The fact that social background is a much stronger selection factor than race in determining program enrollment (Table 2.4) would support this conclusion.

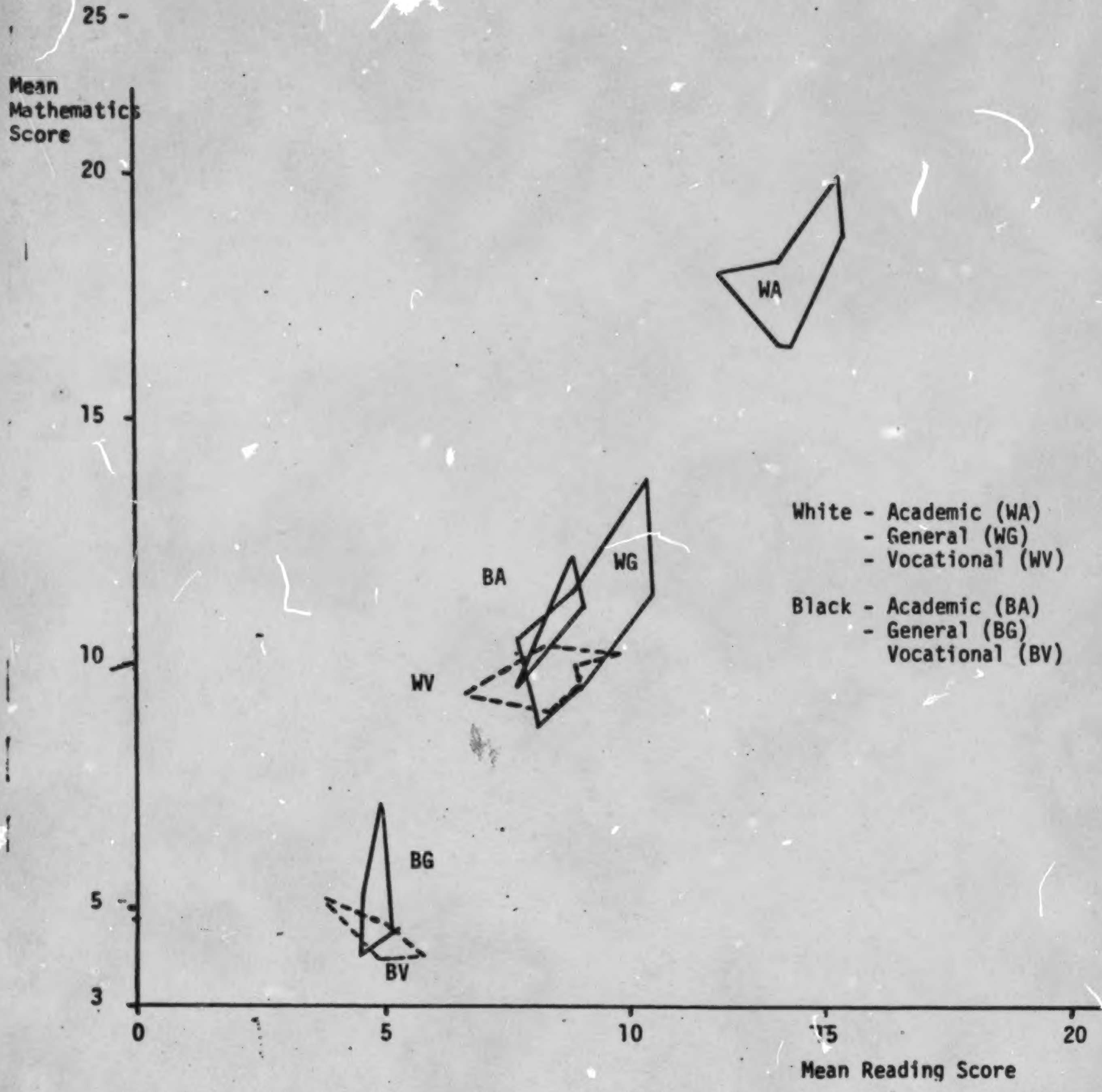
We have plotted the reading and mathematics means given in Table 3.26 in Figure 3.4. This figure displays these means in the form of two dimensional polygons for race-program combinations which are defined by vertices corresponding to combinations of father's education and sex. The race-program polygons are widely separated. Essentially, pupils fall into three gross achievement groupings: high -- white vocational; middling -- black academic, white general, white vocational; and low -- black general, black vocational. The most important findings being that pupils in vocational and general curricula do not differ widely in achievement, regardless of race, and that black pupils in the academic curriculum do not differ greatly in achievement from white pupils in the general or vocational curricula.

**Table 3.26** Means of Mathematics, Reading, and Vocabulary Test Scores,* by Race, Sex, Father's Education, and High School Program.

| | General | | | Academic | | | Vocational | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dropout | High School Graduate | College Graduate | Dropout | High School Graduate | College Graduate | Dropout | High School Graduate | College Graduate |
| **Mathematics** | | | | | | | | | |
| White - Male | 10.61 | 11.69 | 13.98 | 18.14 | 18.50 | 20.07 | 9.50 | 10.67 | 10.28 |
| - Female | 8.88 | 9.59 | 11.49 | 16.80 | 16.80 | 18.06 | 9.05 | 9.67 | 9.99 |
| Black - Male | 5.27 | 7.15 | 7.23 | 12.18 | 12.18 | 9.52 | 5.22 | 4.82 | 5.92 |
| - Female | 4.01 | 4.35 | 2.73 | 9.70 | 11.10 | 3.36 | 4.17 | 4.18 | 4.49 |
| **Reading** | | | | | | | | | |
| White - Male | 7.85 | 8.75 | 10.39 | 11.50 | 12.35 | 13.37 | 6.70 | 8.14 | 9.45 |
| - Female | 7.79 | 8.70 | 10.29 | 12.40 | 12.56 | 13.64 | 8.35 | 8.67 | 8.82 |
| Black - Male | 4.50 | 4.81 | 5.03 | 8.79 | 8.82 | 9.20 | 3.69 | 4.72 | 7.50 |
| - Female | 4.48 | 5.09 | 2.35 | 7.37 | 8.88 | 10.72 | 4.94 | 5.57 | 5.15 |
| **Vocabulary** | | | | | | | | | |
| White - Male | 4.77 | 5.54 | 6.88 | 7.54 | 8.35 | 9.53 | 4.18 | 5.00 | 5.52 |
| - Female | 4.39 | 5.65 | 6.89 | 8.43 | 8.72 | 9.86 | 4.76 | 5.68 | 6.00 |
| Black - Male | 2.22 | 2.53 | 3.94 | 4.86 | 5.51 | 2.77 | 2.09 | 2.15 | 6.78 |
| - Female | 2.38 | 2.43 | 2.13 | 3.82 | 5.41 | 10.53 | 2.47 | 3.42 | 1.33 |

*Formula scores -- corrected for chance responses.

Figure 3.4 Mathematics and Reading Achievement Polygons* for Race and High School Program Groups.



*Each polygon is drawn from vertices representing pairs of means (reading, mathemathics) for combinations of sex (male, female) and father's education (dropout, high school graduate, college graduate). See Table 3.26 for the plotted means. Means for blacks whose fathers were college graduates were not plotted because the small sample sizes made the points too unstable.

If we were able to take into account the prior achievement levels which formed part of the program selection process, we could assess the effect of enrollment in a particular curriculum on the developed abilities measured during these pupils' senior year. Because we have no prior measurement, this is not possible. However, it is still useful to adjust achievement differences among curricula for variations in hours of instruction and work for two reasons:

1. Such an adjustment should be an over adjustment, as amounts of instruction and work are, in part, a result of prior abilities and other characteristics which are positively related to developed abilities at grade 12. Thus, we may regard the adjustment as a maximum which bounds the possible effects of actual instructional and work experiences in the last three years of high school.
2. When we turn to post-secondary effects, it will be useful to assess, at least qualitatively, the potential magnitudes of the effects of high school experiences as they affect labor market outcomes via developed academic abilities versus skills which are not assessed in tests oriented toward academic abilities. This partitioning of effects can also inform our inferences about the "labeling" effects of the curricula, once we have a rough notion of the potential magnitude of the "skill" effects.

Table 3.27 exhibits the results of calculations based on regression analyses of vocabulary scores on hours of academic instruction, vocational instruction, and work for sub-groups defined by each combination of high school program, race and sex (Appendix Table D3). Formally, these analyses allow different relations between the experience variables (work, vocational, and academic hours) and achievement for each sub-group, i.e., "interactions" between experience, race, sex, and program. The table displays:

**Table 3.27** Differences in Vocabulary Score Means Between High School Programs, Before and After Adjustment for Discrepancies in Hours of Academic and Vocational Instruction and Work, By Race and Sex.

| | White | | | | | | Black | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | | Female | | | Male | | | Female | | |
| | Mean | (1)* | (2)** | Mean | (1)* | (2)** | Mean | (1)* | (2)** | Mean | (1)* | (2)** |
| General | 5.52 | 5.99 | 4.72 | 5.32 | 5.99 | 4.83 | 2.33 | 2.54 | 1.92 | 2.26 | 1.97 | 0.98 |
| Academic | 8.55 | 8.75 | 7.00 | 9.03 | 9.18 | 7.26 | 5.23 | 4.91 | 2.69 | 4.96 | 5.14 | 3.45 |
| Vocational | 4.68 | 5.45 | 4.67 | 5.28 | 6.09 | 5.35 | 2.26 | 1.51 | 2.21 | 2.70 | 3.48 | 2.86 |
| **Contrasts** | | | | | | | | | | | | |
| General - Vocational | 0.84 | 0.54 | .05 | .04 | - .10 | - .52 | .07 | 1.03 | - .29 | - .44 | -1.51 | -1.88 |
| Academic - Vocational | 3.87 | 3.30 | 2.33 | 3.75 | 3.09 | 1.91 | 2.97 | 3.40 | .48 | 2.26 | 1.66 | .59 |
| **Contrast Change as Percent of Mean Contrast** | | | | | | | | | | | | |
| Academic - Vocational | | -15% | -40% | | -18% | -49% | | +114% | -84% | | -27% | -74% |

*Condition (1) sets the hours of exposure variables at the following levels: Academic - 20.5, Vocational - 1.5, Work - 8.0

**Condition (2) sets the hours of exposure variables at the following levels: Academic - 17.0, Vocational - 6.0, Work 20.0.

(1) the actual vocabulary means for each group;

(2) estimated vocabulary means for each group at each of two sets of levels of the experience variables (one corresponding to a strongly "vocational" pattern and the other to a strongly "academic" pattern for work and school experiences);

(3) estimated achievement contrasts across curricula for each race/sex group at (a) the original experience composition, and at (b) the two artificially fixed experience compositions. The reason for the selection of two such compositions (patterns of experience levels) is to allow differential effects ("interactions") to appear.

To assess the effects, we have selected the most extreme curricular contrast to examine: Academic programs versus Vocational programs. The bottom line of the table shows that when pupils' experiences are equated with respect to vocational and academic course work and hours of employment, there are still differences in vocabulary scores. It also shows that the degree of reduction in the original achievement spread among the programs varies by:

(1) the pattern of experience chosen for "equating", and

(2) race.

Generally, if pupils are given experience patterns which are strongly "vocational", i.e., low academic hours (17), high vocational hours (6), heavy work experience (20 hours), curricular differences remain large; typically within 25 percent of the original discrepancy. However, if they are given a strongly academic pattern, i.e., high academic hours (20½), low vocational hours (1.5), and little work (8 hours), the achievement gap drops considerably, the remaining difference ranging from less than 20 to about 60 percent of the original difference, depending on the race/sex group. Also, the differences seem to drop more extremely for blacks than for whites.

Examining the estimated means, a credible interpretation of these results -- given the fact that a much larger proportion of vocational pupils come from families with poor educational backgrounds -- is that giving pupils with such poor backgrounds extensive academic training and not taking up study time with work will improve their test performance on measures of academic ability to a significant but not extraordinary degree. But, lessening the amount of academic instruction and increasing vocational instruction and work of students from families with good educational backgrounds, will cause a severe deterioration in test performance. This is supported by the data. Academic program students loose much more in test performance by having course and work experiences like vocational pupils, than vocational pupils gain from acquiring experiences like the academic pupils.

### 3.8 College Entrance Course Requirements: An Integration of Instructional Exposure

Colleges and universities place restrictions on the academic backgrounds of the high school students who would matriculate to them. And these requirements vary considerably from one post-secondary institution to another. We have selected three such universities as graded examples of such entrance requirements. To accomplish this we arranged the specific course requirements outlined by three college catalogues: Those of Harvard, Northern Michigan University and Purdue. Appendix E gives these requirements in detail and describes their interrelations.

We coded each pupil's academic record according to whether he or she met the course requirements of each institution. Table 3.28 summarizes the general results. There we see that Harvard accepts as qualified only five percent of all high school seniors. Northern Michigan and Purdue, on the other hand, would accept the high school course work of 19 and 47 percent respectively. Comparatively, blacks are more greatly disadvantaged with respect to admission to the institutions with more stringent requirements, perhaps because of the generally lower rate at which they take Foreign Language training. Females, on the other hand, are advantaged relative to males using Harvard standards, but are disadvantaged at the less stringent institutions. This is most likely because females take more Foreign Language but less mathematics and science.

Table 3.28 Rates at Which High School Students of Different Race and Sex Groups Met Course Requirements for Admission to Three Universities.

| | Race | | | |
|---|---|---|---|---|
| Sex | White | Black | Other | Total |
| **Male** | | | | |
| Harvard | 5.16 | 2.25 | 3.08 | 4.78 |
| Northern Michigan | 26.45 | 17.29 | 17.42 | 25.04 |
| Purdue | 53.57 | 46.91 | 41.26 | 52.08 |
| **Female** | | | | |
| Harvard | 5.73 | 3.13 | 4.09 | 5.36 |
| Northern Michigan | 15.88 | 13.68 | 9.98 | 15.24 |
| Purdue | 42.16 | 43.55 | 30.33 | 41.43 |
| **Total** | | | | |
| Harvard | 5.44 | 2.75 | 3.58 | 5.07 |
| Northern Michigan | 21.20 | 15.23 | 13.97 | 19.08 |
| Purdue | 47.90 | 45.00 | 36.29 | 46.76 |

If we examine the curricular differences (Table 3.29), we find striking results. The overwhelming controlling factor on college admission requirements is high school program. There are some race and sex differences, but these are much smaller than the program differences and tend to parallel those discussed above.

No blacks in vocational programs meet the requirements for Harvard. Less than one percent of whites in such programs meet those requirements. On the other hand, about 10 percent of pupils in academic programs meet them and this percentage does not vary significantly by race. Similar differences exist for the other two universities and again there are no important racial differences. It seems that accounting for high school program removes all racial effects in access to university-level education. There are significant sex differentials within programs, but these are as above: advantages to females for entry to Harvard, disadvantages for entry to Northern Michigan and Purdue.

Table 3.29 Rates of Satisfaction of Colleges Entrance Requirements, by Program, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Institution/Program | Male | Female | Male | Female |
| **Harvard** | | | | |
| General | 1.43 | 0.52 | 0.18 | 0.37 |
| Academic | 9.41 | 11.64 | 8.14 | 10.19 |
| Vocational | 0.14 | 0.50 | 0.00 | 0.00 |
| **Northern Michigan** | | | | |
| General | 12.12 | 5.38 | 11.12 | 7.03 |
| Academic | 43.40 | 28.97 | 42.41 | 33.93 |
| Vocational | 6.44 | 2.21 | 4.01 | 2.77 |
| **Purdue** | | | | |
| General | 41.55 | 28.05 | 41.05 | 40.73 |
| Academic | 70.93 | 63.26 | 71.10 | 64.67 |
| Vocational | 29.63 | 17.40 | 31.65 | 24.85 |

## 4. Post-Secondary Training and Labor Force Participation

### 4.1 Patterns of Training and Work: 1972 to 1976

In this section, the high school class of 1972 will be generally characterized in their work histories by selecting two time points for examination: October 1972 and October 1976. Over this period, large changes occurred in the employment, work hours and earnings of these former pupils (Table 4.1). In 1972 about 50 percent of these individuals reported that they were working. The work rate was highest for white males (56%) and dramatically lower for black females (40%). By 1976, however, the percentage who reported work hours had risen substantially. White males -- 82 percent, white females -- 70 percent, black males -- 81 percent and black females -- 68 percent. Thus, we see substantial sex differentials emerging but practically non-existent differences in employment among the racial groups by 1976. Those racial equalities were achieved, however, by much greater increases in work participation on the part of blacks (especially females) than whites. Work hours per week also measured (by around 15%, generally) to essentially 40 hours for males and 36 hours for females by 1976.

Average hourly wage rates showed the strongest race and sex differences and also the largest differential changes from 1972 to 1976. In 1972, the group with the highest wage rate was white females ($3.54). The group with the lowest rate was the white males ($2.99). However, by 1976 the white male wage rate had increased by 51 percent to become the largest of those four groups. White females, on the other hand, increased their hourly wages by only 3 percent (to $3.64). Black male gains (+35%) far outpaced those for black females (+10%), although neither group managed to average wage equality with their white counterparts by 1976.

Table 4.1 Employment, Work Hours, and Earnings, 1972 to 1976, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| **1972** | | | | |
| Percent who reported working* | 55.7 | 49.6 | 50.2 | 39.6 |
| Percent who reported earnings* | 55.1 | 48.5 | 49.4 | 38.0 |
| Weekly hours worked by those working | 35.3 | 31.3 | 34.5 | 29.7 |
| Weekly earnings ($) by those working | 105.48 | 110.81 | 108.70 | 96.44 |
| Hourly wage rate ($) by those working | 2.99 | 3.54 | 3.15 | 3.25 |
| **1976** | | | | |
| Percent who reported working* | 82.1 | 70.1 | 81.3 | 67.8 |
| Percent who reported earnings* | 80.6 | 68.8 | 80.6 | 66.3 |
| Weekly hours worked by those working | 41.1 | 36.0 | 39.3 | 36.1 |
| Weekly earnings ($) by those working | 185.30 | 131.03 | 166.73 | 128.79 |
| Hourly wage rate ($) by those working | 4.51 | 3.64 | 4.24 | 3.57 |
| **Percent Change 1972-1976** | | | | |
| Those who reported working | +47.4 | +41.3 | +62.0 | +71.2 |
| Those who reported earnings | +47.3 | +41.9 | +63.2 | +74.5 |
| Weekly hours worked | +16.4 | +15.0 | +13.9 | +21.6 |
| Weekly earnings | +75.7 | +18.3 | +53.4 | +33.5 |
| Hourly wage rate | +50.8 | + 2.8 | +34.6 | + 9.9 |

*These values are obtained directly from the responses to the hours and earnings questions in the first and third following survey. They are lower than the values from the corresponding activity state categories which are a part of the public use data file and which are based on multiple sources of information.

The work rates given in Table 4.1 are not the inverse of unemployment rates. Unemployment is defined as not working, but at the same time looking for work. The intent of this definition is to exclude those who are occupied in other pursuits (schooling, homemaking), or who are otherwise not interested in finding a job. This definition can be criticized because it omits discouraged workers, because large percentages of post-secondary school enrollees work, and because there is now a considerably greater flow of workers in and out of the labor force. However, using the "official" definition of unemployment, we constructed characterization of employment histories of these groups (Table 4.2). In doing so, we counted the number of times that each individual was unemployed during the five Octobers of this period (1972, 1973, 1974, 1975, and 1976). Clearly, if one were to define chronic unemployment as being unemployed 4 or 5 times during this period, there would be very little of it. However, as we broaden the span which we consider problemetic, larger rates emerge. When we count individuals who are unemployed three or more times, almost 6 percent of black females and two and one-half percent of black males are in the problemetic

Table 4.2 Unemployment Histories, 1972-1976, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| No. of Times Unemployed | Male | Female | Male | Female |
| 5 | 0.0 | 0.0 | 0.0 | 0.3 |
| 4 or more | 0.1 | 0.1 | 0.3 | 1.0 |
| 3 or more | 0.9 | 0.8 | 2.5 | 5.7 |
| 2 or more | 4.0 | 4.3 | 11.1 | 18.5 |
| 1 or more | 19.6 | 22.7 | 34.1 | 46.0 |
| 0 | 80.4 | 77.3 | 65.9 | 54.0 |

category. Extending the boundary by one additional incident (to 2 or more times), we find almost 20 percent of black females, 11 percent of black males and about 4 percent of the whites at these levels of unemployment. The racial differences are striking and the extremely high unemployment levels for black females surely diagnoses some of the same problems found above (Table 4.1).*

Part of the changes between 1972 and 1976 which we observed in Table 4.1 have to do with participation in post-secondary education. A large proportion of the high school class of 1972 did participate in additional educational activities (Table 4.3) and this participation lowered initial rates of employment. If we examine the rates of participation in various post-secondary activities, we can see

Table 4.3 Education and Work Status (Percent): October, 1972, by Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Status | Male | Female | Male | Female |
| Vocational training | 6.0 | 9.0 | 7.4 | 10.9 |
| 2-year College | 15.3 | 14.2 | 11.3 | 9.6 |
| 4-year College | 32.5 | 29.4 | 24.8 | 27.0 |
| Work | 61.8 | 53.6 | 58.4 | 45.2 |

that they are indeed overlapping: 62 percent of white males worked in October 1972, while 54 percent engaged in some kind of educational activity. Focusing on the educational activities, we see that rates of vocational training vary from 6 percent (white males) to 11 percent (black females), blacks and females generally participating at high rates. This is opposite of college-going where whites participate at higher rates.

---

*For a discussion of discrepancies between these rates and those derived from the Current Population Survey, see Freeman and Medoff (1979).

For our purposes, however, summarizations of all the experiences which occurred from 1972 to 1976 are more meaningful than status at any particular point in time. Table 4.4 summarizes one characteristic of the total educational experiences to which the pupils were exposed over the period: Percent with college degree. We can see that even by 1976, just five years after graduation, over 15 percent of whites and almost 10 percent of blacks had graduated from a four-year college program. Also, female graduation rates exceeded those of males by 2 to 3 percent.

Table 4.4 Percent of High School Class of 1972 With College Degree by 1976, by Race and Sex.

| | Sex | |
|---|---|---|
| Race | Male | Female |
| White | 15.8 | 17.5 |
| Black | 8.3 | 11.2 |

Another summarization of these individuals' experiences involves a more detailed categorization. Using the responses of the individuals in the third follow-up survey, we established whether their training (a) was for less than two years, more than two years, (b) or did not take place, and (c) was academic, vocational, or mixed. Table 4.5 summarizes the general results of this categorization.

Almost 64 percent of the class of 1972 entered some kind of post-secondary education and this rate hardly varied from males (65%) to females (62%). Even racial differences were small (blacks -- 61%, whites -- 65%). More sub-group differentiation emerged, however, when we examine the amounts and kinds of training in which these individuals took part. Whites more commonly engaged in training for two years or more (42%) as compared with blacks (30%). Whites also participated more frequently in academic (45% vs. 34% for blacks), while blacks more often took part in vocational (19% vs. 14% for whites) or mixed forms of training (8% vs. 6% for whites).

Table 4.5 Post-Secondary Education and Work History to 1976, by Race and Sex.

| Training Category | Total | Sex<br>Male | Female | Racial/Ethnic Group<br>White | Black | Other |
|---|---|---|---|---|---|---|
| None | 36.30 | 35.00 | 37.61 | 34.82 | 38.69 | 48.18 |
| Some | 63.70 | 65.00 | 62.39 | 65.18 | 61.31 | 51.82 |
| Less than 2 years | 23.96 | 23.02 | 24.90 | 23.31 | 31.19 | 22.15 |
| 2 years or more | 39.74 | 41.97 | 37.49 | 41.87 | 30.11 | 29.67 |
| Vocational | 14.11 | 13.38 | 14.84 | 13.73 | 18.85 | 12.46 |
| Academic | 43.14 | 44.86 | 41.40 | 45.12 | 34.12 | 33.86 |
| Mixed | 6.44 | 6.76 | 6.11 | 6.34 | 8.34 | 5.27 |

## 4.2 High School Programs and Their Relations to Post-Secondary Experiences

The high school programs of secondary pupils of the class of 1972 not only strongly influenced their educational experiences in high school, they also strongly contributed to and constrained their post-secondary choices and experiences. Fully 61 percent of pupils in vocational programs did not participate in any formal schooling during the four years following high school (Table 4.6), but only 15 percent of academic program pupils did not so participate. And these strong program differences are also the rule rather than the exception for amounts and types of training as well. Sixty-five percent of pupils who were in academic programs engaged in two or more years of training (vs. 16% for vocational and 22% for general) and an absolute majority (57%) was engaged for these two years solely in academic pursuits (as opposed to 7% of vocational pupils and 16% of those who were in general programs).

Table 4.6 High School Program Differences in Post-Secondary Experience.

| | General | Academic | Vocational |
|---|---|---|---|
| No-Training | 49.03 | 14.64 | 60.86 |
| Less Than 2 Years | 29.08 | 20.70 | 23.58 |
| Vocational | 13.38 | 5.74 | 14.83 |
| Academic | 11.95 | 12.41 | 6.87 |
| Vocational/Academic | 3.75 | 2.54 | 1.88 |
| 2 Years or More | 21.89 | 64.66 | 15.55 |
| Vocational | 3.04 | 2.71 | 6.89 |
| Academic | 15.83 | 56.76 | 6.84 |
| Vocational/Academic | 3.02 | 5.18 | 1.82 |
| Total Trained | 50.97 | 85.36 | 39.13 |
| Vocational | 16.42 | 8.45 | 21.72 |
| Academic | 27.78 | 69.17 | 13.71 |
| Vocational/Academic | 6.77 | 7.73 | 3.70 |

Amazingly, after controlling for high school program, important race and sex differences disappear (Appendix Table D.4). Thus, Table 4.6 represents accurately the rates at which pupils in the different high school programs participated in different forms of post-secondary education, regardless of race or sex.

Given these large relations between high school program participation and post-secondary educational activity, it is reasonable to probe the relations of high school course taking and high school work to post-secondary training for pupils of various types. Tables 4.7.1 - 4.7.4 exhibit these relations. They are based on regression analyses relating post-secondary educational category membership dichotomies (one if in the particular category, zero otherwise) to tested academic achievement (vocabulary, reading comprehension, mathematics) and course and work experiences (academic hours, vocational hours, work hours) for each race and sex group.

Table 4.7.1 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, White Males.

| Variable | No Training | Less Than Two Years | More Than Two Years | Vocational | Academic | Vocational/ Academic |
|---|---|---|---|---|---|---|
| Constant | 74.128 | 19.654 | 6.217 | 21.171 | 3.674 | 1.053 |
| Scores | | | | | | |
| Vocabulary | - 0.887 | - 0.531 | 1.417 | - 0.603 | 1.514 | - 0.103 |
| Reading | - 0.844 | 0.406 | 0.437 | - 0.021 | 0.030 | 0.295 |
| Mathematics | - 1.473 | - 0.507 | 1.980 | - 0.322 | 1.538 | 0.065 |
| Hours | | | | | | |
| Academic | - 0.687 | 0.366 | 0.320 | -0.190 | 0.495 | 0.095 |
| Vocational | 1.704 | 0.107 | - 1.811 | 1.103 | - 1.568 | - 0.136 |
| Work | 0.271 | 0.149 | - 0.421 | 0.098 | - 0.415 | 0.054 |
| Mean | 33.18 | 22.43 | 44.39 | 28.66 | 43.58 | 12.51 |

**Table 4.7.2** Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, White Females.

| Variable | No Training | Less Than Two Years | More Than Two Years | Vocational | Academic | Vocational/ Academic |
|---|---|---|---|---|---|---|
| **Constant** | 72.852 | 21.773 | 5.375 | 19.364 | 4.046 | 3.738 |
| **Scores** | | | | | | |
| Vocabulary | - 0.660 | - 0.629 | 1.289 | - 0.399 | 0.924 | 0.135 |
| Reading | - 0.549 | 0.074 | 0.475 | - 0.198 | 0.801 | - 0.054 |
| Mathematics | - 1.578 | - 0.187 | 1.765 | - 0.329 | 1.825 | 0.082 |
| **Hours** | | | | | | |
| Academic | - 0.739 | 0.206 | 0.533 | 0.032 | 0.568 | 0.139 |
| Vocational | 2.578 | 0.128 | - 0.706 | 0.718 | - 0.863 | - 0.433 |
| Work | 0.215 | 0.043 | - 0.215 | - 0.109 | - 0.071 | - 0.035 |
| Mean | 36.51 | 24.22 | 39.28 | 14.35 | 43.05 | 5.29 |

Table 4.7.3 Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, Black Males.

| Variable | No Training | Less Than Two Years | More Than Two Years | Vocational | Academic | Vocational/ Academic |
|---|---|---|---|---|---|---|
| Constant | 61.655 | 46.843 | - 8.498 | 32.828 | - 5.682 | 11.199 |
| Scores | | | | | | |
| Vocabulary | - 2.017 | 0.788 | 1.229 | - 0.077 | 0.684 | 1.410 |
| Reading | - 0.474 | - 0.073 | 0.547 | 0.205 | 0.658 | - 0.389 |
| Mathematics | - 1.756 | - 0.479 | 2.235 | - 0.402 | 2.308 | - 0.150 |
| Hours | | | | | | |
| Academic | - 0.215 | - 0.623 | 0.838 | - 0.642 | 1.088 | - 0.231 |
| Vocational | 0.847 | - 0.737 | - 0.110 | - 0.445 | - 0.880 | - 0.412 |
| Work | 0.013 | - 0.103 | 0.090 | - 0.164 | 0.026 | 0.125 |
| Mean | 39.23 | 30.19 | 30.57 | 18.47 | 33.98 | 8.31 |

**Table 4.7.4** Regression Coefficients Relating Post-Secondary Educational Experiences to Developed Academic Abilities and Course and Work Participation Assessed at the End of High School, Black Females.

| Variable | No Training | Less Than Two Years | More Than Two Years | Vocational | Academic | Vocational/ Academic |
|---|---|---|---|---|---|---|
| **Constant** | 65.717 | 34.781 | - 0.500 | 24.939 | 2.778 | 6.925 |
| **Scores** | | | | | | |
| Vocabulary | 0.679 | - 1.622 | 0.943 | - 0.344 | - 0.452 | 0.117 |
| Reading | - 2.205 | 0.226 | 1.979 | - 0.525 | 2.255 | 0.475 |
| Mathematics | - 0.737 | - 0.271 | 1.009 | - 0.263 | 1.351 | - 0.350 |
| **Hours** | | | | | | |
| Academic | - 0.996 | 0.068 | 0.927 | 0.051 | 0.826 | 0.118 |
| Vocational | 1.362 | - 0.235 | - 1.127 | - 0.398 | - 0.559 | - 0.405 |
| Work | 0.027 | 0.259 | - 0.285 | 0.104 | - 0.109 | - 0.021 |
| Mean | 38.28 | 31.94 | 29.77 | 19.13 | 34.22 | 8.36 |

Recalling that these post-secondary categories are defined independently of high school program, we note that earlier small race differentials in training rates are again exhibited in the means displayed in Tables 4.7. However, the constant terms in the regressions for the no training category display a different pattern: lower values for blacks than white. This implies that once test performance and high school experiences are accounted, blacks have a greater probability of entering post-secondary education than whites.* This is not a new finding (see, e.g., Peng, 1977); however, it appears that we have identified the major vehicle by which these post-secondary racial differentials occur: High School Program. That is, given that racial differentials in achievement are great within each of the primary high school programs (vocational, general, academic) and given that racial differentials in post-secondary educational activities are quite small for pupils in the same high school programs, it follows that holding achievement constant we will find large differences in the rate of post-secondary educational participation. I.e., high school program is so powerful in controlling aspirations and/or credential labeling for post-secondary education that the large achievement differentials are almost entirely overridden.

---

*This differential is actually increased if we further adjust the estimated rates by setting achievement and experience levels to values in the ranges of actual levels for these pupils.

However, when we probe the kinds and amounts of post-secondary education, we find somewhat different results. For example, if we focus on post-secondary vocational education we find that pupils with typical values -- given the overall distributions -- for test scores and hours of course and work experience,[*] have about the same rate of entry regardless of race or sex (black females -- 16.8%; black males -- 17.5%; white females -- 17.8%; white males -- 16.4%).[**] Thus, the advantages in post-secondary educational entry that blacks have over whites of the same measured ability levels are restricted to academic training.

If we contrast the general effects of test scores, course exposure and high school work with each other and with program effects on percent with "no training" we find the following orders of magnitude for white males:

---

[*] We have set the values of test scores at 5 (vocabulary), 8 (reading), 10 (mathematics) and the experience hours at 20 (academic), 4 (vocational), and 10 (work). Adjusted values were calculated by combining these values with the regression coefficients and constant term, e.g., white males: $16.4\% = 21.2 + (-0.60)(5) + (-0.02)(8) + (-0.32)(10) + (-0.19)(20) + (1.10)(4) + (0.10)(10)$.

[**] It should be noted that, within the experience category, work hours has by far the weakest effect.

| | |
|---|---|
| 1. Program Differences<br>(Academic - Vocational = 58% - 14% = 44%) | 44 Percent |
| 2. Test Score Differences<br>Simultaneous score point differences of 7 (Vocabulary), 8 (Reading), and 15 (Mathematics) | 35 Percent |
| 3. High School Experience Differences<br>Hours differences of 4 (Academic), 5(Vocational), 10 (Work) | 14 Percent |

Thus program has by far the greatest effect, followed closely by developed abilities, and then by experience. However, this is a little misleading because we are not accounting the effects of course and work experience on test score differences between academic programs. Even if we reduce our assessments of the true effects of experience on tested performance discussed in Section 3.8 by half, we would estimate that the achievement gap between vocational and academic program pupils -- with course and work experience typical of vocational enrollees -- would drop by 20 percent. On the other hand (see below) controlling for experience and ability only reduces the post-secondary difference by 3 percent. Thus -- accounting for the effects of experience on tested ability we end up with the following effects for white males:

1. Program (adjusted for experience and ability) 33 percent,
2. Test Scores (net of mediated effects of experience) 23 percent,
3. Experiences (direct and mediated) 21 percent.

This implies that the total effects on post-secondary educational participation of the high school experiences -- assessed by our measure of academic exposure and work -- are about two-thirds as powerful as high school program. However, the total effects of developed abilities and experiences are about half again as large as the direct program effects. Recalling also the fact that program, course-taking, and work are synergistically tied together, we are again impressed with the extraordinary and pervasive effects of the students' high school curricular programs on subsequent educational experience.

Table 4.8 displays the results of regression analyses conducted -- with the "no training" dichotomy as the dependent variable -- for subgroups defined by race, sex and high school program. As an example of the use of these tables, effects of high school program on post-secondary training, net of test scores and high school experience variables can be calculated. If we do so, the fitted values for e.g., white males in vocational programs is 24.4% and the corresponding value for those in academic programs is 57.2, and the adjusted contrast is, therefore, 32.8 percent. As the difference in the corresponding percentages was 44.4 percent (=58.5 - 14.0, see Appendix Table D.4), the adjustment for ability and experiences reduced the high school program effect on post-secondary enrollment by 26 percent. These were the figures used in the calculation above.

---

*Here as above we used the values cited in the earlier footnote for independent variable values. Thus, e.g., 24.4% = (0)(5) + (-1.61)(8) + (-1.21)(10) + (0)(20) + (-0.74)(4) + (0.18)(10).

Table 4.8 Regression Coefficients for "No Training" by Program, Race and Sex.

| | Academic | | | | Vocational | | | |
|---|---|---|---|---|---|---|---|---|
| | White | | Black | | White | | Black | |
| | Male | Female | Male | Female | Male | Female | Male | Female |
| **Constant** | 42.404 | 35.840 | 27.239 | 52.199 | 83.408 | 81.63 | 67.875 | 61.686 |
| **Score** | | | | | | | | |
| Vocabulary | - 0.932 | - 0.341 | - 0.478 | - 0.346 | * | 0.093 | - 2.429 | 0.178 |
| Reading | - 0.271 | - 0.197 | 1.127 | - 0.686 | - 1.607 | - 0.756 | - 1.839 | - 0.265 |
| Mathematics | - 0.447 | - 0.852 | 1.446 | - 0.860 | - 1.206 | - 0.187 | - 1.315 | - 1.746 |
| **Hours** | | | | | | | | |
| Academic | - 0.626 | - 0.164 | - 0.365 | - 0.921 | * | - 0.616 | 0.576 | - 0.567 |
| Vocational | 0.961 | 0.974 | 0.232 | 1.481 | - 0.739 | 0.485 | 0.318 | - 0.310 |
| Work | 0.205 | 0.030 | 0.360 | 0.229 | 0.184 | - 0.147 | 0.462 | 0.658 |

*Coefficients not estimated because the magnitude of the estimate was too small in relation to its precision. This suppression biases the direct comparison of coefficients, but does not seriously disturb comparison of predicted values.

## 4.3 High School Experience and Labor Market Outcomes

Our exposition in the first section of this chapter focussed on some of the more important labor market outcomes: Hours worked, Wages and Wage Rate (Table 4.1). The second section has exposed the great importance of high school program in the determination of participation in post-secondary education. It also explored the relative roles played by program, course exposure, and high school work in determining such participation. This section will combine these foci; displaying and interpreting the relations of program, course and work experience to the three measures of labor market activity.

The pattern of labor market activity from 1972 to 1976 for pupils in different high school programs is approximately what one would expect from extrapolating the general patterns of post-secondary educational participation (Table 4.9). Those who were in academic programs while in high school tend to go on to academic post-secondary pursuits and these last longer than two years. Thus, they worked less both in 1972 (less than 50% working in all race and sex groups) and in 1976 (about 80% working for all four groups) than those who were in vocational or general programs. Former vocational pupils worked by far the most in both 1972 (75% for white males to 59% for black females) and 1976 (95% for white males and 75% for females of both races), and those who were in general programs fell in between those who had been in academic and vocational programs in both years. It is significant that large sex differences in work rates existed for former general and vocational pupils in both 1972 and 1976 as well as for academic program pupils in 1972, but that these sex differentials had entirely disappeared for the latter group by 1976. Race differentials in work rates existed in 1972, primarily for former vocational and general pupils but these disappeared in all groups by 1976. Unemployment (1972 to 1976), as we saw in Table 4.2, varied substantially over both races and sexes;

Table 4.9 Percent of Those Who Worked (1972, 1976) and Who Were Never Unemployed (1972-1976), by High School Program, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| Program | Male | Female | Male | Female |
| General | | | | |
| Work - 1972 | 70.28 | 60.13 | 64.95 | 53.56 |
| - 1976 | 91.97 | 70.10 | 90.63 | 74.26 |
| Never Unemployed | 90.02 | 88.80 | 79.16 | 74.29 |
| Academic | | | | |
| Work - 1972 | 47.09 | 40.13 | 49.67 | 44.34 |
| - 1976 | 81.51 | 78.30 | 77.80 | 79.61 |
| Never Unemployed | 91.75 | 88.66 | 82.96 | 84.32 |
| Vocational | | | | |
| Work - 1972 | 75.44 | 69.69 | 65.48 | 59.33 |
| - 1976 | 94.56 | 73.90 | 91.99 | 76.25 |
| Never Unemployed | 90.45 | 87.91 | 78.36 | 69.02 |
| All Programs | | | | |
| Work - 1972 | 59.93 | 53.23 | 60.54 | 52.72 |
| - 1976 | 87.40 | 75.13 | 87.24 | 76.79 |
| Never Unemployed | 90.98 | 88.50 | 79.75 | 75.89 |

however, high school program effects were essentially non-existant except for black females -- the highest levels for these individuals being characteristic of those who were in vocational programs (31% unemployed at least once) and the lowest levels pertaining to former academic pupils (16%).

We now turn to analyses relating high school experiences to these labor market activities. Our first attempt at such relations analyzes our three indices of work activity (hours, wages, and wage rates) in relation to hours of high school exposure to work, academic and vocational instruction, and tested academic abilities (vocabulary, reading comprehension, and mathematics). We will first focus on white males, combining over curricular programs. In order to facilitate valid analyses over time (1972 to 1976), we have split the white male sample into three subsamples: those who worked in 1972 only, those who worked in 1976 only, and those who worked in both years. These three subgroups constituted 7.1 percent, 38.4 percent, and 54.6 percent of the white male group, respectively (Table 4.10). The group which exhibits the highest test scores, the least amount of high school work and vocational course work, and the greatest number of hours of academic instruction consisted of those who did not work in 1972 but did so in 1976; i.e., primarily those who also attended institutions of post-secondary education. The mirror image of this group (most high school work and vocational education, least academic work, lowest test scores) was formed by those who worked in both years.

In both 1972 and 1976, more hours were worked at higher wage rates by those who worked during both years in contrast to those who worked in one year only. (Note that we have included the means of the (natural) logarithms of hours, wages and wage rates as well as the original values. It is the transformed values which will be used in later regression analyses.)

Table 4.10 Means of High School Experience Characteristics, Test Scores, and Labor Market Outcomes (1972 and 1976) for White Males by Work Pattern.*

| | Subgroup: Worked in | | |
|---|---|---|---|
| | 1972 Only | 1976 Only | 1972 and 1976 |
| Percent in Subgroup | 7.1 | 38.4 | 54.6 |
| **Means** | | | |
| High School - Work Hours | 16.45 | 14.11 | 19.17 |
| - Academic Hours | 18.96 | 19.69 | 18.93 |
| - Vocational Hours | 2.67 | 2.38 | 3.17 |
| Test Scores - Vocabulary | 7.05 | 7.20 | 6.18 |
| - Reading | 10.53 | 10.67 | 9.72 |
| - Mathematics | 15.19 | 15.64 | 13.67 |
| **1972** | | | |
| Work Hours Per Week | 31.60 | | 35.49 |
| Wages Per Week | 78.97 | | 91.28 |
| Hourly Wage Rate | 2.43 | | 2.63 |
| Log (H) | 3.32 | | 3.47 |
| Log (W) | 4.14 | | 4.32 |
| Log (WR) | 0.825 | | 0.850 |
| **1976** | | | |
| Work Hours Per Week | | 40.11 | 41.82 |
| Wages Per Week | | 173.73 | 191.98 |
| Hourly Wage Rate | | 4.48 | 4.63 |
| Log (H) | | 3.61 | 3.69 |
| Log (W) | | 4.98 | 5.14 |
| Log (WR) | | 1.372 | 1.448 |

*There are some inconsistencies between the values in this table and those in Table 4.1. These have arisen because of the use of multiple sources of data for the work categorization in this table; i.e., the use of "activity state" rather than item-specific categories.

Table 4.11 reports the estimates of relational parameters obtained by performing regression analyses within the work pattern subgroups. These analyses focussed on weekly work hours, wages and wage rates in 1972 and 1976. The regression analyses performed with the 1972 data were accomplished for those who (a) worked in 1972 only, and (b) worked in both 1972 and 1976. The analyses of the 1976 data were performed using those who (c) worked in 1976 only and (b) worked in both years. The wage and hour data were (natural) logarithmically transformed in the analysis. This was done for two reasons: (1) The linear regression specification was a better fit to the transformed than to the original data and (2) the multiplicitive identity linking the work characteristics (Wages = (hours worked) X (wage rate)) is made additive by the transformation (log (wages) = log (hours) + log (rate)) and therefore the regression parameters (constant term, slope coefficients) are also made additive by the transformation. This feature forces the distinct analyses to be consistent and this, in turn, greatly eases the process of interpretation.

In the most general terms:

(1) Former pupils who had higher test performance generally worked fewer hours and had lower wage rates, although this was much less true in 1976 than in 1972. Surely, the key to this finding has to do with experience in the labor force, pupils who went directly on to post-secondary training are either still employed part time or have not yet "caught up" to their more experienced former classmates.

(2) Former pupils who worked considerable hours during high school were advantaged in hours of weekly employment although this effect was also weaker in 1976 than in 1972. High school work, however, gave little advantage in wage rate either in 1972 or 1976.

Table 4.11 Parameter Estimates for Regressions of Labor Market Outcome Characteristics on High School Experience Characteristics and Test Scores, for White Males, by Work Pattern.

| | 1972 | | 1976 | |
|---|---|---|---|---|
| | Worked in | | Worked in | |
| | 1972 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **Log (Hours) X 100** | | | | |
| Constant | 390.90 | 372.60 | 379.83 | 382.47 |
| Work Hours | 0.690 | 0.520 | 0.403 | 0.266 |
| Academic Hours | -1.693 | -0.928 | -0.538 | -0.530 |
| Vocational Hours | 2.601 | 1.801 | 0.916 | 0.537 |
| Vocabulary | -1.321 | -1.373 | -0.812 | -0.717 |
| Reading | -1.704 | 0.222 | -0.511 | -0.159 |
| Mathematics | -1.205 | -1.252 | -0.289 | -0.330 |
| **Log (Wages) X 100** | | | | |
| Constant | 477.62 | 471.67 | 510.10 | 528.36 |
| Work Hours | 0.929 | 0.478 | 0.551 | 0.439 |
| Academic Hours | -1.869 | -1.274 | -0.278 | -0.612 |
| Vocational Hours | 3.446 | 1.841 | 0.901 | 1.031 |
| Vocabulary | -2.237 | -1.269 | -1.659 | -0.806 |
| Reading | -2.030 | 0.055 | -0.689 | -0.471 |
| Mathematics | -1.021 | -1.679 | 0.205 | -0.391 |
| **Log (Wage Rate) X 100** | | | | |
| Constant | 86.72 | 99.06 | 130.27 | 145.89 |
| Work Hours | 0.239 | -0.042 | 0.148 | 0.173 |
| Academic Hours | -0.175 | -0.345 | 0.260 | -0.082 |
| Vocational Hours | 0.845 | 0.040 | -0.015 | 0.494 |
| Vocabulary | -0.916 | 0.103 | -0.847 | -0.089 |
| Reading | -0.326 | -0.167 | -0.178 | -0.313 |
| Mathematics | 0.183 | -0.427 | 0.494 | -0.061 |

(3) Former pupils who took greater amounts of academic course work than their peers were also disadvantaged with respect to weekly hours of employment, but again this effect was smaller in 1976 than in 1972. Only minute affects on wage rates were exhibited in either year.

(4) Those who were exposed to more hours of vocational instruction enjoyed considerably greater weekly work hours in October of 1972 and marginally greater work hours in 1976. The effect on wage wate in 1972 was consistantly positive, but small; and in 1976, effects were neither consistant nor large.

We have attempted to make these findings (in Table 4.11) more directly apprehensible in Table 4.12. There we have computed the estimated effects on work hours, wage rates, and total weekly wages which would accompany a specified modification in high school work, academic and vocational instruction. These modifications were selected to represent variations in these experience features which (approximately) corresponded to hours variations exhibited by various groups of high school pupils (i.e., variations over programs, race and sex groups). The incremental values selected were work +10 hours, academic instruction -4 hours, vocational instruction · +5 hours. As the outcome indices were logarithmically transformed, these experience differences were easily converted into percentage changes in the original outcome characteristics.*

---

*I.e., $\ln(y_2) - \ln(y_1) = \ln(y_2/y_1) = a + bx_1 - a + bx_2 = b(x_1 - x_2)$, so $\exp(b(x_1 - x_2)) = y_2/y_1$ and the percentage increase is merely 100 times the coefficient times the hours modification minus 100. Total changes can be calculated by summing the products before exponentiating.

Table 4.12 Percent Changes in Work Hours, Wage Rates and Wages Accompanying Modifications* in High School Experiences.

| | 1972 | | 1976 | |
|---|---|---|---|---|
| | Worked in | | Worked in | |
| | 1972 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **Weekly Hours of Work** | | | | |
| High School-Work Hours | + 7.1 | + 5.3 | + 4.1 | + 2.7 |
| -Academic Hours | + 7.0 | + 3.8 | + 2.2 | + 2.1 |
| -Vocational Hours | +13.9 | + 9.4 | + 4.7 | + 2.7 |
| Total Change | +30.6 | +19.6 | +11.4 | + 7.8 |
| **Hourly Wage Rate** | | | | |
| High School-Work Hours | + 2.4 | - 0.4 | + 1.5 | + 1.7 |
| -Academic Hours | + 0.7 | + 1.4 | - 1.0 | + 0.3 |
| -Vocational Hours | + 4.3 | + 0.2 | - 0.1 | + 2.5 |
| Total Change | + 7.6 | + 1.2 | + 0.4 | + 4.6 |
| **Weekly Wages** | | | | |
| High School-Work Hours | + 9.7 | + 4.9 | + 5.7 | + 4.5 |
| -Academic Hours | + 7.8 | + 5.2 | + 1.1 | + 2.5 |
| -Vocational Hours | +18.8 | + 9.6 | + 4.6 | + 5.3 |
| Total Change | +40.5 | +21.1 | +11.8 | +12.7 |

*The modifications were:

| | |
|---|---|
| High School Work | +10 hours |
| Academic Instruction | - 4 hours |
| Vocational Instruction | + 5 hours |

In addition, we have computed the change which would accompany the simultaneous modification of all three values. This total modification would correspond, approximately, to the changes which would accompany relocating pupils across curricula. All effects are expressed in terms of the percentage increase that would occur if high school work and vocational instruction were increased and academic instruction was decreased by the designated amounts.

In total, the modifications would have increased weekly work hours by 20 and 30 percent in 1972, and by only 8 to 11 percent in 1976, a considerable decrease over time in effect. Wage rate would have increased somewhat in 1972 (1 to 8%) but even less (0 to 5%) in 1976. Total weekly wages, therefore, would have increased 20 to 40 percent in 1972 but only 12 to 13 percent in 1976. It is difficult to believe that these effects will persist as more of those who participated in post-secondary education enter the labor force and gain experience.

It should be noted, however, that these estimates potentially understate the short-term total impact of school-related experiences on subsequent labor market outcomes. Given our earlier analyses linking high school experience and test scores (Chapter 2, Appendix Table D.3), which exhibited positive relations of academic hours and negative ones of work and vocational instruction to achievement, we can estimate the potential indirect effects of school-related experiences on labor market outcomes as they are mediated through developed academic abilities.

When we do this, however, the total effects on work hours are small (5% in 1972 and 2% in 1976 after reduction for bias due to lack of control for initial abilities) and those on wage rates are tiny (at most 1% when we look at the largest effects, i.e., those on sporatic labor market participants). Even though we could expect these effects to be somewhat larger if (1) more specific and job-related abilities had been measured, and (2) categories of course exposure had been more finely subdivided linked to occupational skills, our overwhelming impression is that the weakening of the relationships between 1972 and 1976. And the negative direction of those relations, for exposure to academic instruction and developed academic abilities, signals the inadequate assessment of these effects, because former pupils with high levels of these characteristics inevitably go on to academic post-secondary instruction and, as mentioned above, these individuals work less than full time while enrolled and have less experience once they enter the labor force.

If we briefly explore these effects (Table 4.13), we find strong support for our view.

If we pick the "No Training" (33% of white males) and "More Than 2 Years - Academic" (36% of white males) as comparison groups we see that contrast in work hours is considerable. The academic training group averages 17 or 18 percent fewer weekly work hours than the group who had no training, but the discrepancy in wage rate is only 6 to 10 percent. If we examine the regression relations of high school experiences to these outcomes (Table 4.14), we see that they are considerably modified by controls for post-secondary training pattern. If we attend primarily to the larger groups: Academic training/work in 1976 only and No training/work in 1972 and 1976, the relations of those with no training are somewhat similar to the earlier -- general -- results, especially for 1976 work hours. There, high school work relations are consistant, vocational hours relations are similar in sign but of smaller magnitude, and academic hours relations greatly reduced. For the individuals with more than 2 years of academic training, high school work relations are stable, but academic instruction in high school has a negative impact. And vocational instruction may have positive effects for those learning academic pursuits, but may also have emerged as a negative factor for those who have been steady workers over whole period. Focussing on wage rates, again primarily for the larger groups, vocational training emerges as a negative influence especially for those who seem to have just entered the labor force after academic training. Academic hours of instruction has small but consistently positive effects, especially for the two largest groups, and high school work has effects consistent with the earlier analyses. In spite of the fact that these analyses reflect smaller sample sizes than the earlier ones, it seems clear that some

**Table 4.13** Labor Market Outcomes (1976) for White Males, By Post-Secondary Training Pattern.

| Training Pattern | | Hours Work Per Week | | Hourly Wage Rate ($) | | Weekly Earnings ($) | |
|---|---|---|---|---|---|---|---|
| | | Worked 1976 Only | Worked 1972 & 1976 | Worked 1976 Only | Worked 1972 & 1976 | Worked 1976 Only | Worked 1972 & 1976 |
| No Training | | 44.08 | 44.16 | 4.63 | 4.81 | 187.70 | 209.48 |
| Less Than 2 Years | - Vocational | 45.80 | 44.09 | 4.04 | 4.56 | 176.59 | 196.13 |
| | - Academic | 41.67 | 41.80 | 4.60 | 4.33 | 182.62 | 180.13 |
| | - Mixed | 44.35 | 42.21 | 4.97 | 4.79 | 217.40 | 195.76 |
| More Than 2 Years | - Vocational | 41.33 | 42.83 | 4.65 | 5.23 | 193.76 | 222.69 |
| | - Academic | 36.73 | 36.12 | 4.36 | 4.32 | 159.14 | 156.00 |
| | - Mixed | 36.67 | 36.89 | 4.84 | 4.13 | 165.57 | 153.94 |

Table 4.14 Regression Relations of High School Experience Characteristics to Labor Market Outcomes (1976) for White Males with Selected Post-Secondary Training Patterns.*

| | No Training | | More Than 2 Years - Academic | |
|---|---|---|---|---|
| | Worked 1976 Only | Worked 1972 & 1976 | Worked 1976 Only | Worked 1972 & 1976 |
| Log (Hours) X 100 | | | | |
| Work Hours | 0.573 | 0.233 | 0.458 | 0.245 |
| Academic Hours | 0.100 | -0.201 | -0.614 | -1.106 |
| Vocational Hours | 0.617 | 0.277 | 0.609 | -1.474 |
| Log (Wage Rate) X 100 | | | | |
| Work Hours | -0.132 | 0.166 | 0.218 | -0.129 |
| Academic Hours | -0.188 | 0.158 | 0.372 | 0.097 |
| Vocational Hours | 1.115 | -0.292 | -1.115 | 2.189 |
| Log (Wages) X 100 | | | | |
| Work Hours | 0.441 | 0.399 | 0.676 | 0.116 |
| Academic Hours | -0.088 | -0.043 | -0.242 | -1.009 |
| Vocational Hours | 1.732 | 0.234 | -0.506 | 0.715 |

*See text and Table 4.11 for exposition of the full specification of the analyses.

part -- and perhaps a large one -- of the earlier results reflects short-term effects due to the entangling of vocational with academic pupils. Thus, these findings leave us with inadequate guidance about the effects of vocational instruction and work experience on the labor market viability of pupils who enrolled in vocational education programs in secondary school.**

---

**A study presumably bearing on these issues is that of Meyer and Wise (1979). In that study they attempted to estimate the effects of a number of factors on wage rates, number of weeks worked, and school attendance, for each of the four years (October to October) between 1972 and 1976. They found that weeks worked were strongly related to high school work experience. One problem with their analyses is the continuing resegmentation of the sample in each succeeding year. If there are strong pattern effects of school/work shifts, the school/non-school division in any given year may not adequately homogenize the sample with respect to differential effects. This could be especially true in the Meyer/Wise study as they completely omitted any characterization of either high school program or patterns of course work.

## 4.4 High School Program and Labor Market Outcomes

Given these general results for white males and our strong suspicions about the biases accumulating because of the omission of high school program from the above analyses, we will here explore differences in relations of high school experiences to outcomes for each program.* Table 14.15 exhibits 1976 work hours, wages and wage rates by high school program, race and sex for our two work patterns (1976 only, and 1972 and 1976). Generally, large differences in weekly work hours occur over high school programs even though we focus only on those who were working in 1976.

Below, we focus on the white male and white female groups, omitting blacks because the sample sizes are too small to allow adequately precise estimation of the relevant coefficients. Essentially we will repeat the analysis strategy of Section 4.3 for six subgroups: White males and females who were enrolled in each of the high school programs -- vocational, academic, vocational. We will suppress the reporting of regression parameter estimates other than those for hours of high school work, academic and vocational instruction, converting these -- as was done in Tables 4.11 and 4.12 above -- into percentage changes in the outcome characteristics.

---

* An important coneptual difference between these analyses and those of previous investigators, in addition to actually accounting hours of course work, is that we presume that high school "tracks" or programs are holistic in their impacts. Thus, we expect strong interactions between track, on the one side, and course exposure, work, and tested abilities, on the other, as they affect post-secondary outcomes. To the extent that this perspective is valid, it implies that earlier analyses have been based on seriously misspecified analytic models.

Table 14.15 Mean 1976 Work Hours, Wage Rates, and Wages, by High School Program, Race, Sex, and Work Pattern..

| | White | | | | Black | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| Program | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **General** | | | | | | | | |
| Hours | 42.02 | 42.51 | 37.17 | 37.94 | 41.66 | 38.97 | 36.99 | 37.16 |
| Wages | 177.14 | 193.46 | 122.97 | 143.83 | 161.50 | 170.63 | 130.20 | 134.56 |
| Wage Rate | 4.31 | 4.63 | 3.32 | 3.78 | 3.92 | 4.45 | 3.60 | 3.74 |
| Log (H) | 3.69 | 3.71 | 3.56 | 3.59 | 3.69 | 3.62 | 3.57 | 3.58 |
| Log (W) | 5.05 | 5.13 | 4.64 | 4.83 | 4.93 | 5.03 | 4.76 | 4.81 |
| Log (WR) | 1.361 | 1.420 | 1.078 | 1.20 | 1.238 | 1.408 | 1.188 | 1.225 |
| **Academic** | | | | | | | | |
| Hours | 38.13 | 39.54 | 34.63 | 34.19 | 35.71 | 37.90 | 34.48 | 34.09 |
| Wages | 168.28 | 176.80 | 134.21 | 133.75 | 158.49 | 146.99 | 119.52 | 113.71 |
| Wage Rate | 4.59 | 4.45 | 3.93 | 4.11 | 4.43 | 3.97 | 3.56 | 3.23 |
| Log (H) | 3.54 | 3.61 | 3.47 | 3.44 | 3.42 | 3.59 | 3.48 | 3.47 |
| Log (W) | 4.92 | 5.03 | 4.75 | 4.71 | 4.83 | 4.90 | 4.65 | 4.60 |
| Log (WR) | 1.377 | 1.420 | 1.277 | 1.270 | 1.409 | 1.314 | 1.170 | 1.135 |
| **Vocational** | | | | | | | | |
| Hours | 44.41 | 43.81 | 36.55 | 37.29 | 39.24 | 42.46 | 38.76 | 37.57 |
| Wages | 188.65 | 209.27 | 120.19 | 134.41 | 168.27 | 194.05 | 133.40 | 144.34 |
| Wage Rate | 4.34 | 4.85 | 3.26 | 3.58 | 4.25 | 4.44 | 3.42 | 3.79 |
| Log (H) | 3.76 | 3.75 | 3.55 | 3.58 | 3.66 | 3.74 | 3.65 | 3.60 |
| Log (W) | 5.14 | 5.27 | 4.66 | 4.80 | 5.00 | 5.14 | 4.82 | 4.88 |
| Log (WR) | 1.30 | 1.521 | 1.116 | 1.223 | 1.338 | 1.400 | 1.173 | 1.280 |

Table 4.16 displays the regression coefficients linking the high school experience characteristics -- work hours, hours of academic and vocational instruction -- to weekly hours worked in 1976 and the accompanying wage rate. These coefficients were derived, as in the above tables, by including test scores (vocabulary, reading, mathematics) in the equation which we estimated. Thus, they represent employment effects net of those captured in these particular tests. As above, we have transformed these coefficients into estimates of the percent change in weekly work hours and wage rates which would accompany a series of changes in work and instructional exposure:

1) work: +10 hours,

2) academic instruction: -4 hours, and

3) vocational instruction: +5 hours,

thus simulating a major modification in schooling and related experiences. As we are, in these analyses, accounting program effects by performing the analyses for each high school program separately, the original modification might be somewhat extreme -- within program group -- but we have kept it for comparative purposes with the above analyses. The effect of this modification is to somewhat overstate effects which might actually be difficult to accomplish in practice. The effects of these modifications, in terms of percentage changes in work hours and wage rates is given in Table 4.17. Generally, the effects on weekly work hours of the modification is positive, although considerably smaller than the effects found earlier. Clearly, there were large effects of high school program which were partly confounded with experiences and not removed by the previous analyses. Specifically high school work experience has small but consistently positive effects on weekly work hours, but the effects of academic and vocational instruction are not consistent enough to be sure if the effects interact with program and sex or if their separate effects are poorly estimated after removal of the considerable variation over programs.

**Table 4.16** Regression Coefficients*Relating High School Course Exposure and Work Experience to Wages and Hours Worked in 1976, by High School Program, and Sex for Whites.

| | Male | | Female | |
|---|---|---|---|---|
| | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **Log (Hours) X 100** | | | | |
| **General** | | | | |
| Work Hours | 0.249 | 0.228 | 0.051 | 0.019 |
| Academic Hours | 0.205 | -0.327 | 0.090 | 0.560 |
| Vocational Hours | 1.405 | 1.022 | 0.095 | 0.542 |
| **Academic** | | | | |
| Work Hours | 0.508 | 0.316 | -0.249 | 0.534 |
| Academic Hours | -0.828 | -0.635 | - | -0.425 |
| Vocational Hours | -0.102 | -0.383 | 1.720 | 1.578 |
| **Vocational** | | | | |
| Work Hours | 0.217 | 0.183 | 0.270 | -0.113 |
| Academic Hours | 0.082 | -0.534 | -0.395 | 0.124 |
| Vocational Hours | -0.482 | -0.250 | 1.252 | 1.279 |
| **Log (Wage Rate) X 100** | | | | |
| **General** | | | | |
| Work Hours | 0.502 | 0.413 | 0.160 | 0.170 |
| Academic Hours | 0.920 | 0.384 | -0.380 | 0.748 |
| Vocational Hours | 0.514 | 0.129 | -0.258 | -0.284 |
| **Academic** | | | | |
| Work Hours | -0.017 | - | 0.131 | 0.391 |
| Academic Hours | -0.086 | -0.347 | - | -0.292 |
| Vocational Hours | -0.604 | 0.434 | -0.288 | -0.534 |
| **Vocational** | | | | |
| Work Hours | 0.214 | -0.073 | 0.055 | 0.439 |
| Academic Hours | 1.015 | 0.238 | 1.101 | 0.941 |
| Vocational Hours | -0.488 | -0.376 | -0.018 | 0.015 |

*Dashed values ("-") indicate that this estimate was small relative to its precision and the computing algorithm omitted if from the equation.

**Table 4.17** Percent Changes for Whites in Work Hours and Wage Rates (1976) Accompanying Modifications* in High School Experiences, by High School Program and Sex.

| | Male | | Female | |
|---|---|---|---|---|
| | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **Weekly Hours of Work** | | | | |
| General - Total | +9.1 | +9.1 | + 0.6 | + 0.7 |
| High School Work Hours | +2.5 | +2.3 | + 0.5 | + 0.2 |
| Academic Hours | -0.8 | +1.3 | - 0.4 | - 2.3 |
| Vocational Hours | +7.3 | +5.2 | + 0.5 | + 2.7 |
| Academic - Total | +8.2 | +3.9 | + 6.3 | +16.1 |
| High School Work Hours | +5.2 | +3.2 | - 2.5 | + 5.5 |
| Academic Hours | +3.4 | +2.6 | - | + 1.7 |
| Vocational Hours | -0.5 | -1.9 | + 9.0 | + 8.2 |
| Vocational - Total | -0.6 | +2.8 | +11.1 | + 4.8 |
| High School Work Hours | +2.2 | +1.8 | + 2.7 | - 1.1 |
| Academic Hours | -0.3 | +2.2 | + 1.6 | - 0.5 |
| Vocational Hours | -2.4 | -1.3 | + 6.5 | + 6.6 |
| **Hourly Wage Rage** | | | | |
| General - Total | +3.9 | +3.2 | + 1.8 | - 4.0 |
| High School Work Hours | +5.1 | +4.2 | + 1.6 | + 1.7 |
| Adacemic Hours | -3.7 | -1.5 | + 1.5 | - 3.0 |
| Vocational Hours | +2.6 | +0.6 | - 1.3 | - 2.9 |
| Academic - Total | -2.8 | +3.6 | - 0.1 | + 2.4 |
| High School Work Hours | -0.2 | - | + 1.3 | + 4.0 |
| Academic Hours | +0.2 | +1.4 | - | + 1.2 |
| Vocational Hours | -3.1 | +2.2 | - 1.5 | - 2.7 |
| Vocational - Total | -4.3 | -3.6 | - 3.9 | + 0.7 |
| High School Work Hours | +2.2 | -0.7 | + 0.6 | + 4.5 |
| Academic Hours | -4.1 | -1.0 | - 4.5 | - 3.8 |
| Vocational Hours | -2.5 | -1.9 | - 0.1 | + 0.1 |

*See Table 4.12 for details on modifications.

Total effects on wage rates vary over programs. Within programs, high school work has generally positive impacts, but again effects of academic and vocational instruction vary over subgroups. In order to overcome some of the potentially random variability over groups, we have aggregated the total effects, in percentage terms, across the two work patterns: 1976 only and 1972 and 1976. As we noted above, there is considerable variation in work pattern over programs. Table 4.18 displays the proportions of males and females in each program with each pattern. E.g., whereas only 29 percent of white male vocational pupils working in 1976, did not work in 1972, 64 percent of white female academic pupils had that work pattern. These percentages were used to combine the values in Table 4.17 to produce Table 4.19. There we see somewhat more stable aggregate results.

Table 4.18 Percent of Whites Who Worked in 1976 in Various Work Pattern Groups, by Sex and High School Program.

| | Male Worked in | | Female Worked in | |
|---|---|---|---|---|
| Program | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| General | 33.7 | 66.3 | 43.0 | 57.0 |
| Academic | 52.8 | 47.2 | 63.6 | 36.4 |
| Vocational | 29.1 | 70.9 | 33.8 | 66.2 |

Table 4.19 Percent Change, for Whites, in Work Hours and Wage Rates, 1976, Accompanying a Simultaneous Modification* of High School Work, Academic and Vocational Instruction.

| | Weekly Work Hours | | Hourly Wage Rate | |
|---|---|---|---|---|
| Program | Male | Female | Male | Female |
| General | +9.1 | +0.7 | +3.4 | -1.5 |
| Academic | +6.1 | +9.9 | +0.2 | +0.8 |
| Vocational | +1.8 | +6.9 | -3.8 | -0.9 |

*See Table 4.12 for details.

The modification, which systematically makes pupils more "vocational" has as we stated above generally positive effects on weekly work hours, but these may be smaller for females who were in general programs and males who were in vocational ones. Effects on wage rates are more varied and potentially important. Apparently, the more "vocational" the program and work experience of a vocational enrollee, the lower his wage rate in 1976. This effect is non-existant for those who were in academic programs, but holds for females in general programs, perhaps because they already take more vocational courses than males in such programs. Perhaps this finding says that, by 1976, taking "too much" vocational course work has negative consequences for wage rates.

The within-program effects we have been discussing are relatively small. None, in total, is larger than ten percent and the typical effect value for our modifications is closer to five percent. However, if we look at the estimates of the hour and wage means for the groups we have been discussing -- holding all characteristics used in the regression constant at a typical value -- we still find very large differences among groups (Table 4.20).

Both sex and program (vocational vs. academic) differences in weekly work hours typically exceed ten percent, females and former academic pupils working less in 1976 than males and former vocational pupils. There are only small differences in work hours by work pattern. Adjusted wage rates also differ between sexes and programs. The sex differences are as expected, but the program differences -- after this adjustment -- are not. Former academic pupils are close to parity with vocational ones, but their rates exceed those of general pupils, for those those who worked in both 1972 and 1976. In fact, for females, adjusted wage rates for those who were in academic programs exceed those of individuals who were in vocational curricula. Also, there are considerable 1976 wage rate differentials between those who did not work in 1972 and those who did. Clearly, there is a payoff to a consistant post-secondary work history. All of these results also tend to confirm our suspicion; that work hours and wage rate patterns have not stabilized because of differential histories of post-secondary educational participation.

Table 4.20 Adjusted* Mean Weekly Work Hours and Wage Rates for Whites (1976), by Sex, Work Pattern, and High School Program.

| | Males | | Females | |
|---|---|---|---|---|
| | 1976 Only | 1972 & 1976 | 1976 Only | 1972 & 1976 |
| **Hours** | | | | |
| General | 40.01 | 40.57 | 35.39 | 36.34 |
| Academic | 37.13 | 37.61 | 36.42 | 33.36 |
| Vocational | 42.76 | 41.10 | 33.19 | 34.96 |
| **Wage Rate** | | | | |
| General | 3.84 | 4.00 | 2.94 | 3.46 |
| Academic | 3.86 | 4.43 | 3.51 | 3.43 |
| Vocational | 4.00 | 4.67 | 3.02 | 3.39 |

*Adjusted for tested developed abilities and high school experiences (work, academic and vocational instruction). For values used for establishing common experiences were: test scores: vocabulary - 5, reading - 8, mathematics - 10; hours of experience: work - 10, vocational - 4, academic - 20.

## 5. Conclusion

This study of Vocational Education and the data analyses we performed leave us dissatisfied, just as we have been with all the other studies on vocational education that we have examined. The reasons for this are obvious.

The definition of vocational education, or more specifically, of what constitutes a vocational curriculum, is at best vague. And this situation has only been slightly helped by the U.S. Office of Education's efforts to codify and standardize information pertaining to curriculum and instruction. We lack basic reflection on what the role of schools should be in preparing pupils for life; be it work life, higher education, combinations thereof, on personal and private life. And the situation is not really better for so-called academic and general programs or tracks, only the common core of accepted courses is more uniform. It seems that "general" and "academic" stands for more basic and less specific and "vocational" for varied and specialized.

Surely, vocational tracks and schools have been set up for students who are typically described as having "lower qualities"; of course, from the stand point of the academic track viewer. The vocational track is for students who cannot make it in the academic track, who come from disadvantaged backgrounds, who have lower abilities and learning motivation (than academic track students), who are more dropout prone, and who will end up in low-level occupations. Thus, vocational curricula are not intended to also advance students for careers as scientists, engineers, physicians or lawyers. Vocational curricula are for the disadvantaged, in a general sense. This is the present situation, although we feel it is time for change, and/or reconcepualization and more precise definition.

The other issue that left us dismayed has to do with the data that were to evidence vocational course offering and enrollment; but this is related to the above, the definitional area. The problem is that available data do not cleanly separate vocational curricular enrollment from vocational course enrollment. And it is likely that this is so for two reasons: (1) Vocational curricula as combinations of courses and learning experiences are not always distinctly defined, and (2) most state funding formulas are based on vocational course enrollment and not on enrollment in vocational curricula or programs. Consequently, there is an incentive for schools and districts to define vocational courses rather than programs. Not all schools might distinguish students who are enrolled in vocational programs from students who are enrolled in vocational courses, but could be considered "general" or "academic" track students.

Accordingly, it is a Sysyphos enterprise to determine the fund flow of monies intended to support vocational education. Federal funds specified for vocational education programs go to states and usually enter into the growing state fund pot for vocational education. The states then use funding allocation formulas which although widely varying, are based on course enrollments in vocational education courses or local district budgets. As one might expect, nearly all high schools offer some vocational courses. In fact, only one percent of U.S. high school students in 1972 had no opportunity to enroll in a vocational course. Consequently, resources, federal, state and local, for vocational educations are extremely widely spread, and the typical student, be he in vocational, general or academic track, is likely to receive some vocational education resources during high school.

However, the percentage of schools which offer vocational proprams, is considerably lower (58%) than the percentage of schools offering some vocational courses. But, these schools with actual vocational programs enroll nearly 90 percent of all students. Thus, all large high schools are likely to have vocational programs and some of these are even restricted to those in the vocational track. To determine resource allocation of vocational funds for these specialized schools, is obviously doable. However, to assess what amounts of vocational education funds reach students enrolled in vocational programs in schools which have general, and academic tracks, is presently impossible. Most such schools only count and report course enrollments in an accurate and meaningful fashion and the majority of students in general and academic tracks also enroll in some vocational courses. In order to assess the process and consequences of the allocation of vocational education funds, more consistency among fund distribution formulas, more accurate allocation accounting, and more precise and meaningful pupil accounting are required.

This study has focussed on vocational education as offered in high school vocational programs or tracks. Knowing that in 1972 90 percent of students were in schools with vocational education programs or tracks, we analyzed the vocational track student population; comparing these pupils to general and academic track students. We studied their instructional and work experiences and the consequences of these experiences for educational and labor force participation during the four years (1972-1976) following high school graduation.

Logically, this study is not restricted to vocational education, because vocational education can be meaningfully studied only within the total high school scene. I.e., only comparisons of characteristics and experiences among vocational, general, and academic tracks allow one to assess the role and benefits of high school vocational education programs. Consequently, this study could not be narrowed to the analysis of vocational programs, their enrollments and consequences for later labor force participation. Instead, in this study, we analyzed the selection of students into different tracks and programs, and we then assessed the students' instructional and work experiences. We related these (1) to their high school achievements as assessed by selected achievement tests and (2) to their post-secondary education, work hours and earnings.

Knowing that vocational programs are intended for students who would go into lower level positions and that vocational curricula were to enhance these students' employability and increase their earnings we first analyzed the student populations of the various high school programs. Academic track students, in general, have better educated fathers than students in general tracks and these, in turn, surpass the educational levels of fathers of vocational track students. In fact, social background, characterized through father's education, has, by far, a stronger impact on the selection into the three high school tracks than race or sex. This finding is important in as much as it knocks a hole into the wailing wall of racial and sex discrimination. But, by no means, is this wall to fall, as we shall see when we investigate program or track enrollment in more detail. Very obviously, female students and black students are more often selected into vocational programs than male and white students, although the rate of selection diminishes for all groups as father's educational level increases.

An immediately obtruding question is, whether these characteristics represent selection criteria, or whether they are closely linked to actual performance, *i.e.*, to students' past academic performance and achievement test scores, as the primary selection criteria. We investigated this issue. However, a serious obstacle was that we had no achievement test data for the time point when the students were selected into the different programs. Instead, test data were only available for the students' performances at the end of high school, *i.e.*, in twelth grade. But, as pointed out below, we have good reason to believe that the program gaps in distributions of achievement test scores are similar at the beginning and end of high school.

We compared the test score distributions for mathematics, reading, and vocabulary. The comparison of mean scores for black, white, male, and female students in the three tracks while also accounting for father's educational level, in general, supports the assumption, that track selection is based on students' achievement levels, however, not irrespective of race. This inference is based on the fact that father's educational level has only minute relations to achievement within programs and race/sex groups.

This means then, that the highest achievement level white students and the highest achievers among black students go into the academic track. But there exist considerable differences in mean achievement score between these two subpopulations: The white students' mean achievement scores in all three tested areas are considerable higher than the average achievement scores for black students whose achievement levels more resemble those of white students selected into the general track. The differences between general and vocational track students' achievement averages are less obvious. It seems that the vocational track is attracting black male students who score at the lowest end of achievement tests. This is not the case for either black or white female students. The selection of these female students seems to be also based on other criteria, such as preparation for immediate entry into the work force. Typically, white students in general and vocational tracks score also considerably higher than their black counterparts on the three test areas we selected for scrutinizing, i.e., reading, vocabulary, and mathematics. In total, for male students the track selection process is clearly based on achievement related to race. As intended, the vocational tracks assemble the lowest male achievers. This is not quite so for female students. It seems probable that besides achievement and race, specific labor force participation expectations enter into the track choice for females, resulting also in considerably higher enrollment rates of females in vocational programs.

As one might expect, at least during the early seventies, vocational training for females was nearly synonymous with training for office and secretary type occupations, as 77.4 percent of all female vocational track students were enrolled in "Business." All other vocational program areas have low female enrollment rates, even "Home Economics" (7.4%). It is important here to realize that we are addressing vocational programs not course enrollment: While only 2 percent of all female students were enrolled in a "Home Economics" program, 39 percent of all female students took at least one Home Economics course (see also Grasso, 1978).

For male students enrolled in vocational programs the distribution is likewise uneven. Nearly 70 percent of all male vocational track students were enrolled in programs preparing for "Trade and Industrial Occupations." The next highest program enrollment for males was "Agriculture" with nearly 12 percent of vocational track students. Thus, vocational high school education for males is mostly training for a variety of equipment repair and maintenance jobs and some occupations in construction, such as carpentry and electricity. Of all male twelth graders in 1972, 15.4 percent received vocational training for these occupations, and of all female twelth graders 20.9 percent were receiving vocational training for office type occupations. A more detailed analysis of vocational track students and their selection into the different programs is of interest. For example, with respect to future labor force participation, one would like to know what types of student (in terms of achievement, sex, race, father's education) choose or are selected into which kinds of vocational programs. Are there black versus white programs? Are some programs attracting higher achievers than others? Such an analysis would give some insight into the school's role as feeder into a large number of low-level occupations. However, within this contractual work, we were not able to pursue this task.

The other analysis aspect of the vocational track is the vocational curriculum with respect to course offerings and credits. Of course vocational curricula ential a "general" core, such as courses in English, Social Studies, Art, etc. Actually over the last three years of high school, pupils in vocational programs devote only 26 percent (6.1 hours per week) of their course work to specific vocational instruction, and this surely includes credited work experience -- either in or outside the school -- as well as school-based course work. In order to assess fund use and program quality in vocational programs, these course credits ought to be disentangled. As a comparison, academic track students spend, on the average, 7 percent (1.5 hours per week) of their class time in vocational instruction. And in total, academic track students seem to spend less time in settings which yield course credits than vocational track students: 22.4 versus 23.7 hours per week. How much of this difference could be accounted for by course credits that vocational students receive for work experience, is unclear. The inference that vocational track students receive more instruction, is not warranted from these data. Clearly, vocational track students work more hours per week than academic track students: 16½ versus 11½ hours. Some of this work experience might be accounted under course work.

A surprising finding was the differences in weekly work hours among the various race and sex groups. Generally, male and white students hold jobs more often and work more hours than female and black students. Only 21 percent of white male students held no job in 1972, as compared to 30.6 percent of white females, 36.5 percent of black males and 47.6 percent of black females. Those females and blacks who did hold jobs, typically, worked fewer hours. Of those who worked, 45 percent of white males were holding more than a half-time job (more than 20 hours per week) as compared to 41 percent of black males, 29 percent of white females and 28 percent of black female students. These differences in work participation cannot be considered a consequence of the subgroups' unequal participation in federally-funded programs with work components. Percent program participation is just the reverse of general work participation with the white male students participating least (11%) and black female high school students most (31.2%). Thus, the differences in work participation are a reflection of the structure of the economy and the societal situation in general. Females, especially black females, but also blacks generally, commonly have less extensive participation in the work force; federal programs, such as High School Work Study and Cooperative Vocational Education have had some effect but have still not off-set racial differentials in high school work experience.

The most pressing questions are: What do tracking and work participation mean for subsequent post-secondary education and work? We will first focus on post-secondary education and then on post-secondary labor force participation.

We have noted above that tracking is related to student achievement, in that the lowest achievers of each racial/ethnic group tend to go into vocational programs. This was very distinct for male students, but less so for females. This finding is consistent with the intent for vocational education programs who are geared toward lower level occupations. High school students in the vocational track have higher labor force participation in general and for this track, as well as the general and academic tracks, we found that the more hours pupils work, the less academic course work they take. From these findings we expect that the post-secondary education is lowest for vocational track students, as intended.

If we first restrict the analysis to what percentage of students might satisfy college entrance requirements, irrespective of achievement and other factors entering into admission decisions, we find that vocational track students have best chances of fulfilling necessary course requirements in technically oriented higher education institutions such as Purdue University. Between 25 (black females) and 32 (black males) percent of vocational track students in 1972 were meeting Purdue's course requirement. Just about nobody, except a few white females, in the vocational track met Harvard's course requirements. This contrasts with between 8 (black males) and 12 (white females) percent of academic track students fulfilling Harvard's course requirements and between 63 (white females) and 71 (black males) percent doing so for Purdue. The general track students comparable percentages range inbetween those for the vocational and academic track. In summary, for most vocational program students the doors to higher education seem to stay closed. Consequently, the analysis of post-secondary schooling of the high school class of 1972 by the 1976 follow-up shows that only 39 percent of vocational track students had taken any additional schooling as compared to 85 percent of academic track students. And merely 14 percent of vocational program students had gone through two or more years of college, as compared to 69 percent of academic track pupils. When we investigated how many of the 1972 vocational program students, received some post-secondary vocational training by 1976, we found that this was the case for 22 percent. Thus, the majority of vocational track students end their education with high school graduation.

When analyzing post-secondary education activities for blacks and whites and males and females separately, by track, we found only small differences for type or amount of subsequent training within the three tracks. Thus, the track membership seems to control students' post-secondary education. For the academic track students this also strongly implies that blacks whose achievement levels, on the average, are considerably below white students, go on to college at higher rates than whites of comparable achievement levels. It seems that track and educational expectation or aspirations are strongly intertwined.

The question then remains whether the about 25 percent of students who in 1972 graduated from vocational high school programs had an advantage in their wage rates over other students. Recalling that they worked more during their senior high school year, we also found that, in general, their hourly wages were higher than those of their classmates in the general and academic tracks.

Thus, on the average, vocational track students in 1972 had higher hourly and total earnings than other high school students. In 1976, i.e., four years after graduation from high school, their hourly wage rates and hours worked per week were still above those of students who graduated in 1972 from general and academic tracks, although the differences were less prominent. This implies that general and academic track students had to some extent caught up with the vocational track students in their hourly earnings. But four years after graduation, these wage rates are less predictive of later earnings for all those who received a sizable amount of post-secondary education and have entered a training-related job only a short time before the 1976 follow-up data collection. If for example, we compare 1972 high school graduates who held jobs in both 1972 and 1976 and who received no training beyond high school to those who entered into more than two years of vocational or academic post-secondary training then we can establish a better sense of whether high school programs which entail a low probability for post-secondary education, will be advantageous for later earnings. White males who were labor force participants in 1972 as well as in 1976 and who did not enter into any post-secondary training, earned, on the average, $4.81 per hour in 1976. If we compare to this group white males who were holding jobs in both 1972 and 1976, but also received more than two years of post-secondary vocational training, then we come close to understanding what it means when only 7 percent of vocational track students enter into such training as compared to 22 percent of all high school students. The average hourly wages of this group was $5.23 in 1976. In general, no post-secondary training, a fate of the vast majority of vocational track students, in the long run, will result in low earnings. This means that the ways in which vocational high school programs are presently designed ensure that vocational track students will occupy the lowest steps in the societal strata. Track selection and vocational programs are not meant to allow permeability into higher-level occupations.

This causes us to suspect that the most important feature of vocational high school programs might be dropout prevention and consequently employability. Our question thus is how vocational track high school students' unemployment histories compare to those of general and academic track students. Knowing that race and sex subgroups have differential rates of unemployment, we compared the employment histories for white and black males and females by high school track for 1972, after the students graduated, to 1976. In general, about 9 percent of white males were unemployed at least once during this time period, compared to about 11 percent of white females, 20 percent of black males and 24 percent of black females. Interestingly, the unemployment rates for white males are about the same for students from both general and vocational tracks and a little lower for academic track students. However, for all other subgroups, unemployment was highest among former vocational track students (white females: 12%; black males: 22%; black females: 31%). The largest discrepancy existed for black females who graduated from academic tracks and those who graduated from vocational tracks: 15 versus 31 percent.

Certainly, this finding does not disvalue the vocational education programs. A major issue that we could not address in this study is, how many of the vocational program students would have dropped out of high school, if they had not been in a curriculum that combined course work with actual work experience and earnings. But, of course, it remains also to be investigated how many of the vocational track students would have fared better in a general or academic track, mainly because expectations for combined post-secondary education are significantly higher. Defining the vocational programs as suitable to those who "do not make it otherwise" seems to implant or at least reinforce low career expectations. We do not believe that ability tracking can be avoided at the high school level. However, vocational education programs should be instituted with a view towards some post-secondary education and thus, on the basis of certain courses, allow permeability into higher level occupations.

Knowing that a fifth of all 1972 female high school graduates received -- during high school -- training for secretarial and office type occupations, most of which offer little or no advancement opportunity, seems at best short-sighted or negligent. The picture is the same for those 15 percent of males who during high school were trained as equipment repair and maintenance men. These are the vocational programs with the highest enrollments, but other vocational program areas are likely to support the same results. We have to consider these students' later opportunities in lieu of the courses they were offered and counseled into. To label high school tracks in percent of foregone opportunities definitely does injustice to the 14 year olds who are selected into vocational programs defined in terms of non-advancement.

## References

Calvert, R., Kay, E.R., and Osso, N.A., Schools for Careers: An Analysis of Occupational Courses Offered by Secondary and Post-secondary Schools, 1971. Washington, D.C.: U.S. Government Printing Office, 1975.

Chismore, W.D. and Hill, Q.M., A Classification of Educational Subject Matter. Washington, D.C.: U.S. Government Printing Office, 1978.

Freeman, R.B. and Medoff, J.L., "Why Does the Rate of Youth Labor Force Activity Differ Across Surveys." (draft) National Bureau of Economic Research, 1979.

Grant, W.V. and Lind, C.G., Digest of Education Statistics 1979. Washington, D.C.: U.S. Government Printing Office, 1979.

Grasso, J. T., The Effects of school Curriculum on Young Women. Paper presented at the Annual Meeting of the American Educational Rsesearch Association. Toronto, 1978.

Harnischfeger, A. and Wiley, D.E., "The Teaching-Learning Process in Elementary Schools: A Synoptic View." Curriculum Inquiry, 6, 1976, 5-43.

Harnischfeger, A. and Wiley, D.E., Achievement Test Score Decline: Do We Need to Worry? Chicago: Cemrel, Inc., 1975.

Hwang, E., File Documentation for NLS72 Vocational Education Study. ML-Group, Cemrel, Inc., 1980.

Levinsohn, J.R., Henderson, L.B., Riccobono, J.A., and Moore, R.P., National Longitudinal Study Base Year, First, Second and Third Follow-up DATA FILE USERS MANUAL. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, 1978.

Lewin-Epstein, N., "Vocational Education." in Coleman, J., Bartot, V., Lewin-Epstein, N. and Olson, L., High School and Beyond, a National Longitudinal Study for the 1980's: Policy Issues and Research Design. Chicago: National Opinion Research Center, 1979.

Meyer, R.H. and Wise, D.A., "High School Preparation and Early Labor Force Experience." Kennedy School of Government, Harvard University, 1979.

ML-Group for Policy Studies in Education, Minority Education 1960-1978: Grounds, Gains, and Gaps. Chicago: Cemrel, Inc., 1978.

Osso, N.A., Directory of Secondary Schools with Occupational Curriculums, Public and Nonpublic, 1971. Washington, D.C.: U.S. Government Printing Office, 1973.

Osso, N.A., Vocational Education: Characteristics of Students and Staff, 1972. Washington, D.C.: U.S. Government Printing Office, 1974.

Osterndorf, L., Summary of Offerings and Enrollments in Public Secondary Schools, 1972-73. Washington, D.C.: U.S. Government Printing Office, 1975.

Peng, S., "Trends in The Entry to Higher Education: 1961-1972." Educational Researcher, 6, 1977, 15-18.

Putnam, J.F. and Chismore, W.D., Standard Terminology for Curriculum and Instruction in Local and State School Systems. Washington, D.C.: U.S. Government Printing Office, 1970.

Schmidt, W., High School Counseling: Resources and Impact. Chicago: ML-Group, Cemrel, Inc., 1980.

# Appendix A:

# Vocational Fields

## Table A.1 Vocational Fields Used to Classify Occupational Programs And Curriculums

| 01 | AGRI-BUSINESS OCCUPATIONS |
|---|---|
| 01.01 | Agricultural Production |
| 01.02 | Agricultural Supplies/Services |
| 01.03 | Agricultural Mechanics |
| 01.04 | Agricultural Products |
| 01.05 | Ornamental Horticulture |
| 01.06 | Agricultural Resources |
| 01.07 | Forestry |
| 01.99 | Agriculture, Other |

| 04 | MARKETING & DISTRIBUTION OCCUPATIONS |
|---|---|
| 04.01 | Advertising Services |
| 04.02 | Apparel and Accessories |
| 04.03 | Automotive |
| 04.04 | Finance and Credit |
| 04.05 | Floristry |
| 04.06 | Food Distribution |
| 04.07 | Food Services |
| 04.08 | General Merchandise |
| 04.09 | Hardware, Building Materials |
| 04.10 | Home Furnishings |
| 04.11 | Hotel and Lodging |
| 04.12 | Industrial Marketing |
| 04.13 | Insurance |
| 04.14 | International Trade |
| 04.15 | Personal Services |
| 04.16 | Petroleum |
| 04.17 | Real Estate |
| 04.18 | Recreation and Tourism |
| 04.19 | Transportation |
| 04.20 | Retail Trade, Other |
| 04.31 | Wholesale Trade, Other |
| 04.99 | Distributive Education, Other |

| 07 | HEALTH OCCUPATIONS |
|---|---|
| 07.0101 | Dental Assisting |
| 07.0102 | Dental Hygiene (Associate Degree) |
| 07.0103 | Dental Laboratory Technology |
| 07.0199 | Dental, Other |
| 07.0201 | Cytology (Cytotechnology) |
| 07.0202 | Histology |
| 07.0203 | Medical Laboratory Assisting |
| 07.0204 | Hematology |
| 07.0299 | Medical Laboratory Technology, Other |
| 07.0301 | Nursing (Associate Degree) |
| 07.0302 | Practical (Vocational) Nursing |
| 07.0303 | Nursing Assistant (Aide) |
| 07.0399 | Nursing, Other |
| 07.0401 | Occupational Therapy |
| 07.0402 | Physical Therapy |
| 07.0499 | Rehabilitation Services, Other |
| 07.0501 | Radiologic Technology (X-ray) |
| 07.0502 | Radiation Therapy |
| 07.0503 | Nuclear Medical Technology |
| 07.0599 | Radiologic, Other |
| 07.06 | Ophthalmic |
| 07.07 | Environmental Health |
| 07.08 | Mental Health Technology |
| 07.0901 | Electroencephalograph Technology |
| 07.0902 | Electrocardiograph Technology |
| 07.0903 | Inhalation Therapy |
| 07.0904 | Medical Assisting (Physicians' Office) |
| 07.0906 | Community Health Aide |
| 07.0909 | Mortuary Science |
| 07.0999 | Misc. Health Occupations, Other |
| 07.99 | Health Occupations, Other |

| 09 | HOME ECONOMICS |
|---|---|
| 09.01 | Homemaking: Personal, Home and Family |
| 09.0102 | Child Development |
| 09.0103 | Clothing and Textiles |
| 09.0104 | Consumer Education |
| 09.0106 | Family Relations |
| 09.0107 | Foods and Nutrition |
| 09.0108 | Home Management |
| 09.0109 | Housing and Home Furnishings |
| 09.0199 | Homemaking, Other |
| 09.02 | Home Economics: Occupational Preparation |
| 09.0201 | Care and Guidance of Children |
| 09.0202 | Clothing Mgmt., Production and Services |
| 09.0203 | Food Management, Production and Services |
| 09.0204 | Home Furnishing, Equipment and Services |
| 09.0205 | Institutional & Home Management & Services |
| 09.0299 | Home Economics: Occupational, Other |

| 17 | TRADE & INDUSTRIAL OCCUPATIONS |
|---|---|
| 17.01 | Air Conditioning Instal. & Repair |
| 17.02 | Appliance Repair |
| 17.0301 | Body and Fender Repair |
| 17.0302 | Auto Mechanic |
| 17.0303 | Auto Specialization Repair |
| 17.0399 | Automotive Services, Other |
| 17.0401 | Aircraft Maintenance |
| 17.0402 | Aircraft Operations |
| 17.0403 | Ground Operations |
| 17.05 | Blueprint Reading |
| 17.06 | Business Machine Maintenance |
| 17.07 | Commercial Art Occupations |
| 17.08 | Commercial Fishery Occupations |
| 17.09 | Commercial Photography Occupations |
| 17.1001 | Carpentry, Construction |
| 17.1002 | Electricity, Construction |
| 17.1003 | Heavy Equipment Maint. Operations |

Table A.1 Cont'd.

| | |
|---|---|
| 14 | BUSINESS & OFFICE OCCUPATIONS |
| 14.01 | Accounting & Computing Occ. |
| 14.02 | Bus. Data Processing Systems Occ. |
| 14.03 | Filing, Office Mach., Clerical Occ. |
| 14.04 | Information Communication Occ. |
| 14.05 | Materials Support Occupations |
| 14.06 | Personnel, Training & Related Occ. |
| 14.07 | Steno, Secretarial & Related Occ. |
| 14.08 | Supervisory & Admin. Mgmt. Occ. |
| 14.09 | Typing and Related Occupations |
| 14.99 | Office Occupations, Other |
| 16 | TECHNICAL OCCUPATIONS |
| 16.0101 | Aeronautical Technology |
| 16.0102 | Agricultural Technology |
| 16.0103 | Architectural Technology |
| 16.0104 | Automotive Technology |
| 16.0105 | Chemical Technology |
| 16.0106 | Civil Technology |
| 16.0107 | Electrical Technology |
| 16.0108 | Electronic Technology |
| 16.0109 | Electromechanical Technology |
| 16.0110 | Environmental Control Technology |
| 16.0111 | Industrial Technology |
| 16.0112 | Instrumentation Technology |
| 16.0113 | Mechanical Technology |
| 16.0114 | Metallurgical Technology |
| 16.0115 | Nuclear Technology |
| 16.0116 | Petroleum Technology |
| 16.0117 | Scientific Data Processing |
| 16.02 | Agricultural - Related Technology |
| 16.03 | Health - Related Technology |
| 16.04 | Office - Related Technology |
| 16.05 | Home Economics - Related Technology |
| 16.0601 | Commercial Pilot Training |
| 16.0602 | Fire & Fire Safety Technology |
| 16.0603 | Forestry Technology |
| 16.0604 | Oceanographic Technology |
| 16.0605 | Police Science Technology |
| 16.0699 | Misc. Technical Education, Other |
| 16.9901 | Air Pollution Technology |
| 16.9902 | Water and Waste Water Technology |

| | |
|---|---|
| 17.1004 | Masonry |
| 17.1005 | Painting and Decorating |
| 17.1006 | Plastering |
| 17.1007 | Plumbing and Pipefitting |
| 17.1008 | Drywall Installation |
| 17.1009 | Glazing |
| 17.1010 | Roofing |
| 17.1099 | Construction & Maintenance Trades, Other |
| 17.11 | Custodial Services |
| 17.12 | Diesel Mechanic |
| 17.13 | Drafting Occupations |
| 17.14 | Electrical Occupations |
| 17.15 | Electronics Occupations |
| 17.16 | Fabric Maintenance Services |
| 17.17 | Foreman, Supvr., & Mgmt. Development |
| 17.19 | Graphic Arts Occupations |
| 17.20 | Industrial Atomic Energy Occupations |
| 17.21 | Instrument Maint. & Repair Occupations |
| 17.22 | Maritime Occupations |
| 17.23 | Metalworking Occupations |
| 17.24 | Metallurgy Occupations |
| 17.2601 | Barbering |
| 17.2602 | Cosmetology |
| 17.2699 | Personal Services, Other |
| 17.27 | Plastics Occupations |
| 17.2801 | Fireman Training |
| 17.2802 | Law Enforcement Training |
| 17.2899 | Public Service Occupations, Other |
| 17.29 | Quantity Food Occupations |
| 17.30 | Refrigeration |
| 17.31 | Small Engine Repair, Internal Combustion |
| 17.32 | Stationary Energy Sources Occupations |
| 17.33 | Textile Production and Fabrication |
| 17.34 | Leatherworking |
| 17.35 | Upholstering |
| 17.36 | Woodworking Occupations |
| 17.99 | Trade & Industrial Occupations, Other |

## Appendix B:

## Definition of Hours of Instruction

## Construction of Derived Course-Taking Variables

After merging the student-level and school-level files, roughly 90 new variables were created, to study patterns of actual curricular exposure among students in different high school tracks. In addition, 40 new variables were formed as logical combinations of five of the eight activity states for October of 1972 through 1976. These latter variables were to facilitate classification of post-graduate experiences for students in different curricula.

Creation of these new variables required existing variables from both the student file and each student's associated school record. Following creation, these variables were appended to the merged student level/school level file, facilitating use in conjunction with any of the original variables. The new variables are represented by 324 characters of new information for each student, increasing the length of the merged records from 8983 to 9307 characters.

The attached partial record layout and narrative describe all variables created.

## Partial File Layout: Course-Taking Variables - Merged NLS

| | | |
|---|---|---|
| 8984 - 8986 | Total periods/week of science | (legitskip* = 999) |
| 8987 - 8988 | Total courses in science | (legitskip* = 99) |
| 8989 - 8994 | Total minutes of science | (legitskip* = 999999) |
| 8995 - 8996 | "Total courses" from file minus sum of detailed course tallies plus 50 | (legitskip* = 99). |
| 8997 - 9009 | Ditto for foreign language | |
| 9010 - 9022 | " " social studies | |
| 9023 - 9035 | " " English | |
| 9036 - 9048 | " " Mathematics | |
| 9049 - 9061 | " " Industrial Arts | |
| 9062 - 9074 | " " Commercial | |
| 9075 - 9087 | " " Fine Arts | |
| 9088 - 9090 | Total periods/week of agriculture, before 7/1/69 | (legitskip* = 999) |
| 9091 - 9092 | Total courses in agriculture, before 7/1/69 | (legitskip* = 99) |
| 9093 - 9098 | Total minutes of agriculture before 7/1/69 | (legitskip* = 999999) |
| 9099 - 9101 | Total periods/week of agriculture after 7/1/69 | (legitskip* = 999) |
| 9102 - 9103 | Total courses in agriculture, after 7/1/69 | (legitskip* = 99) |
| 9104 - 9109 | Total minutes of agriculture, after 7/1/69 | (legitskip* = 999999) |
| 9110 - 9111 | "Total courses" from file minus sum of detailed course tallies plus 50 | (legitskip* = 99) |
| 9112 - 9135 | Ditto for Business | |
| 9136 - 9159 | " " Distributive Education | |
| 9160 - 9183 | " " Health Occupations | |
| 9184 - 9207 | " " Home Economics | |
| 9208 - 9231 | " " Trade Occupations | |

---

*For "out of range," replace last digit by 5.

| | |
|---|---|
| 9232 - 9235 | Total periods Academic (Commercial & Industrial Arts excluded)<br>Legitskip, outrange ≥ 9000 |
| 9236 - 9241 | Total minutes (Commercial & Industrial Arts exluded)<br>Legitskip, outrange ≥ 900000 |
| 9242 - 9245 | Total periods Vocational (plus Commercial & Industrial Arts)<br>errors as above |
| 9246 - 9251 | Total minutes Vocational (plus Commercial & Industrial Arts)<br>errors as above |
| 9252 - 9255 | Total periods Vocational (including Commercial if and only if no Business; including Industrial Arts if and only if no Trade Occupations) errors as above |
| 9256 - 9261 | Total minutes Vocational, as for 9252 - 9255. errors as above |
| 9262 | Detailed Group Code (0-9) |
| 9263 | Group2 (0, 1) - 1 if Group = 1 |
| 9264 | Group3 (0, 1) - 1 if Group = 1 or 3 |
| 9265 | Group4 (0, 1) - 1 if Group = 1, 3, 4, or 5 |
| 9266 | Group5 (0, 1) - 1 if Group = 1, 3, 4, 5, 7, or 8 |
| 9267 | Group6 (0, 1) - 1 if Group ≠ 0 |

0 = No, 1 = Yes, 9 = indeterminate

File Narrative: Description of Derived Variables

Total periods/week of Science. This is sum of one times semester courses of science meeting once a week plus two times semester courses meeting twice a week plus three times semester courses meeting three times a week, etc. It is constructed from responses to question SRFQ4. Missing data on any field was propagated to a missing code for the derived variable. The "more than five" column was weighted six.

Total courses in Science. This is the unweighted sum of courses taken, ignoring number of class periods per week. Missing data codes were propagated as for the total periods/week variable.

Total minutes of Science. Computed using SCHQ05 (number of weeks in the school year) and SCHQ06 (Number of minutes in standard class periods), along with total periods/week variable defined above: Total minutes = SCHQ06 x SCHQ05 x (Total periods/week)/2. The division by two is a conversion from semesters to years. Missing data codes on any constituent variables were propagated.

The fourth created variable is a check comparing the "total number of semesters of instruction" from SRFQ4 to the sum of the courses in each category of number of class periods per week.

Variables for foreign language, social studies, English, mathematics, industrial arts, commercial, and fine arts were defined in the same way.

For the course-taking categories listed under question SRFQ5 of the Student Record Information Form, periods per week, courses and minutes were defined in the same way as above, for each of the "before July 1, 1969" and "after July 1, 1969" categories. The check field compares the coded total number of semesters with the sum of all counts across both time periods. These variables are defined for agriculture, business, distributive education, health occupations, home economics and trade occupations.

The variables "total periods academic" and "total minutes academic" are sums of the corresponding variables for science, foreign languages, social studies, English, mathematics, and fine arts. Missing data on any of these component variables caused the sum to be defined as missing.

The variables "total periods vocational" and "total minutes vocational" are sums of the corresponding variables for agriculture, business or commercial, distributive education, health occupations, home economics, and trade industrial occupations. Only courses taken after July 1, 1969 are included in these totals. Missing data codes propagated as for other variables.

An additional pair of variables representing total periods and total minutes vocational were defined in the same way, except that minutes and periods for commercial courses (under SRFQ4) were included if and only if total periods of business or commercial (SRFQ5) was zero, and minutes and periods for industrial arts (SRFQ4) were included if and only if total periods of trade or industrial occupations (SRFQ5) was zero. Missing data propagated as elsewhere.

The detailed group code was used to create a series of indicators of decreasing confidence in the data, as shown in the layout for columns 9263 through 9267. Data for which Group1 is 1 are most reliable, a somewhat more inclusive set is coded 1 for Group2, etc. The detailed group code (column 9262) was defined as follows:

1. Compute an estimate of number of periods per day, NPPD, as number of periods vocational plus number of periods academic, divided by 30 and rounded to the nearest whole number. Total periods vocational from columns 9242 - 9245 is used in this calculation. The constant 30 represents 3 years times 2 semesters per year times 5 days per week. If this variable cannot be formed due to missing data, set group code to 0.
2. Compute double counting indicators for commercial and industrial arts, IDCC and IDCIA, using the corresponding "total courses" fields from questions SRFQ4 and SRFQ5. These indicators are set equal to 0 if one or both fields are either missing or zero, 1 if they are non-zero and equal, and 2 if they are both non-zero but not equal.
3. Compute the detailed group code, IG, using NPPD, IDCC, IDCIA, total periods vocational from columns 9252 - 9255 (NPVOCA) and total periods academic (NPAD), as follows:

   If NPVOCA $\leq$ 20 and NPAC $>0$ and $3 \leq$ NPPD $\leq 9$, let IG = 1

   If NPVOCA $\leq$ 20 and NPAC $>0$ and NPPD = 2, let IG = 2

   If NPVOCA $>$ 20 and $3 \leq$ NPPD $\leq 5$ and IDCC = 0 and IDCIA = 0, let IG = 3

   If NPVOCA $>$ 20 and $3 \leq$ NPPD $\leq 5$ and (IDCC = 1 or IDCIA = 1), let IG = 5

   If NPVOCA $>$ 20 and $3 \leq$ NPPD $\leq 5$ and IG $\neq 3$ and IG $\neq 5$, let IG = 4

If $\mathrm{NPVOCA} > 20$ and $6 \leq \mathrm{NPPD} \leq 9$ and $\mathrm{IDCC} = 0$ and $\mathrm{IDCIA} = 0$ let $\mathrm{IG} = 8$

If $\mathrm{NPVOCA} > 20$ and $6 \leq \mathrm{NPPD} \leq 9$ and ($\mathrm{IDCC} = 1$ or $\mathrm{IDCIA} = 1$), let $\mathrm{IG} = 9$

If $\mathrm{NPVOCA} > 20$ and $6 \leq \mathrm{NPPD} \leq 9$ and $\mathrm{IG} \neq 8$ and $\mathrm{IG} \neq 9$, let $\mathrm{IG} = 7$

Otherwise, let $\mathrm{IG} = 0$.

# Appendix C:

# Course Taking on Student Information Form

**4. How many semester courses will the student have taken in each of the following subjects between July 1, 1969, and the date he or she graduates? How many class periods per week did these courses meet?**

EXAMPLE: If a student took six semester courses in science, and four of these courses met five class periods per week whereas two courses met only three class periods per week, you would enter "6" for the *Total number of semesters of instruction* and "4" and "2", respectively, in the "5" and "3" columns under *Number of class periods per week.*

| **Type of course** | **Total number of semesters of instruction** ▼ | **Number of class periods per week** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **More than 5** | |
| Science | | | | | | | | (1) |
| Foreign languages | | | | | | | | (2) |
| Social studies | | | | | | | | (3) |
| English | | | | | | | | (4) |
| Mathematics | | | | | | | | (5) |
| Industrial arts | | | | | | | | (6) |
| Commercial | | | | | | | | (7) |
| Fine arts or performing arts | | | | | | | | (8) |

**5. Please indicate the total number of semester courses this student will have taken in each of the following vocational-technical subjects by the time he or she graduates. For each subject in which the student has taken courses, please indicate in the appropriate class-periods-per-week columns the number of courses taken before July 1, 1969, and after July 1, 1969.**

| **Type of vocational-technical course** | **Total number of semesters of instruction** ▼ | **Before July 1, 1969** | | | | | | **After July 1, 1969** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Number of class periods per week** | | | | | | **Number of class periods per week** | | | | | | |
| | | **1** | **2** | **3** | **4** | **5** | **More than 5** | **1** | **2** | **3** | **4** | **5** | **More than 5** | |
| Agricultural | | | | | | | | | | | | | | (1) |
| Business or commercial | | | | | | | | | | | | | | (2) |
| Distributive education | | | | | | | | | | | | | | (3) |
| Health occupations | | | | | | | | | | | | | | (4) |
| Home economics | | | | | | | | | | | | | | (5) |
| Trade or industrial occupations | | | | | | | | | | | | | | (6) |

# Appendix D:

# Base Data Tables

Appendix Table D.1.1 Hours of Instruction in Various Curricular Areas, by High School Program, White Males.

| | Program | | | |
|---|---|---|---|---|
| Area | General | Academic | Vocational | Total |
| Science | 2.43 | 3.57 | 1.98 | 2.89 |
| Foreign Language | 0.82 | 2.15 | 0.30 | 1.36 |
| Social Studies | 4.21 | 3.76 | 3.69 | 3.88 |
| English | 4.53 | 4.33 | 4.20 | 4.36 |
| Mathematics | 2.57 | 3.64 | 2.04 | 2.98 |
| Industrial Arts | 1.94 | 0.80 | 2.97 | 1.60 |
| Commercial | 1.47 | 0.88 | 1.25 | 1.14 |
| Arts | 1.41 | 0.97 | 0.59 | 1.03 |
| Total Academic | 19.38 | 20.08 | 17.01 | 19.23 |
| Agriculture | 0.35 | 0.10 | 0.71 | 0.30 |
| Business | 1.06 | 0.64 | 0.95 | 0.83 |
| Distributive Education | 0.10 | 0.03 | 0.35 | 0.11 |
| Health Occupations | 0.04 | 0.05 | 0.03 | 0.04 |
| Home Economics | 0.17 | 0.04 | 0.07 | 0.08 |
| Trade or Industrial | 1.22 | 0.41 | 3.58 | 1.31 |
| Total Vocational | 2.94 | 1.26 | 5.68 | 2.68 |
| Total | 22.32 | 21.34 | 22.69 | 21.91 |

**Appendix Table D.1.2** Hours of Instruction in Various Curricular Areas, by High School Program, White Females.

| Area | Program<br>General | <br>Academic | <br>Vocational | <br>Total |
|---|---|---|---|---|
| Science | 2.10 | 3.06 | 1.68 | 2.48 |
| Foreign Language | 0.92 | 2.58 | 0.66 | 1.63 |
| Social Studies | 4.03 | 3.70 | 3.58 | 3.75 |
| English | 4.46 | 4.33 | 4.18 | 4.33 |
| Mathematics | 2.01 | 3.08 | 1.64 | 2.42 |
| Industrial Arts | 0.20 | 0.12 | 0.16 | 0.15 |
| Commercial | 3.01 | 1.46 | 5.52 | 2.95 |
| Arts | 1.90 | 1.71 | 0.85 | 1.52 |
| Total Academic | 18.61 | 20.05 | 18.29 | 19.23 |
| Agriculture | 0.04 | 0.01 | 0.01 | 0.02 |
| Business | 2.33 | 1.05 | 4.71 | 2.33 |
| Distributive Education | 0.14 | 0.02 | 0.28 | 0.12 |
| Health Occupations | 0.08 | 0.08 | 0.14 | 0.10 |
| Home Economics | 1.51 | 0.52 | 1.08 | 0.93 |
| Trade or Industrial | 0.14 | 0.03 | 0.28 | 0.13 |
| Total Vocational | 4.22 | 1.72 | 6.50 | 3.63 |
| Total | 22.83 | 21.77 | 24.79 | 22.86 |

Appendix Table D.1.3 Hours of Instruction in Various Curricular Areas, by High School Program, Black Males.

| | Program | | | |
|---|---|---|---|---|
| Area | General | Academic | Vocational | Total |
| Science | 2.43 | 3.48 | 2.33 | 2.69 |
| Foreign Language | 0.55 | 2.06 | 0.25 | 0.86 |
| Social Studies | 4.05 | 3.92 | 3.67 | 3.92 |
| English | 4.47 | 4.59 | 4.21 | 4.43 |
| Mathematics | 2.67 | 3.59 | 2.32 | 2.83 |
| Industrial Arts | 1.58 | 0.76 | 1.41 | 1.33 |
| Commercial | 1.13 | 1.00 | 0.88 | 1.02 |
| Arts | 1.32 | 1.12 | 0.95 | 1.17 |
| Total Academic | 18.19 | 20.51 | 16.03 | 18.24 |
| Agriculture | 0.45 | 0.16 | 0.66 | 0.42 |
| Business | 0.88 | 0.72 | 0.62 | 0.76 |
| Distributive Education | 0.14 | 0.01 | 0.37 | 0.18 |
| Health Occupations | 0.12 | 0.04 | 0.06 | 0.08 |
| Home Economics | 0.17 | 0.06 | 0.23 | 0.15 |
| Trade or Industrial | 1.05 | 0.42 | 3.07 | 1.43 |
| Total Vocational | 2.81 | 1.40 | 5.01 | 3.02 |
| Total | 21.00 | 21.91 | 21.04 | 21.26 |

Appendix Table D.1.4 Hours of Instruction in Various Curricular Areas, by High School Program, Black Females.

| | Program | | | |
|---|---|---|---|---|
| Area | General | Academic | Vocational | Total |
| Science | 2.23 | 3.21 | 2.10 | 2.51 |
| Foreign Language | 0.72 | 2.34 | 0.55 | 1.14 |
| Social Studies | 4.00 | 3.71 | 3.70 | 3.84 |
| English | 4.59 | 4.42 | 4.23 | 4.46 |
| Mathematics | 2.55 | 3.36 | 2.06 | 2.66 |
| Industrial Arts | 0.25 | 0.22 | 0.21 | 0.22 |
| Commercial | 2.26 | 1.46 | 3.88 | 2.47 |
| Arts | 1.08 | 1.39 | 0.94 | 1.15 |
| Total Academic | 17.68 | 20.12 | 17.66 | 18.41 |
| Agriculture | 0.03 | 0.00 | 0.00 | 0.01 |
| Business | 1.70 | 1.22 | 3.86 | 2.09 |
| Distributive Education | 0.19 | 0.01 | 0.44 | 0.21 |
| Health Occupations | 0.18 | 0.34 | 0.27 | 0.29 |
| Home Economics | 1.46 | 0.65 | 1.17 | 1.14 |
| Trade or Industrial | 0.11 | 0.07 | 0.67 | 0.24 |
| Total Vocational | 3.67 | 2.29 | 6.41 | 4.00 |
| Total | 21.35 | 22.41 | 24.07 | 22.41 |

**Appendix Table D.2** Work Hours and Foreign Language Instructional Hours, Regression Relations by Race, Sex and High School Program.

| | | White | | Black | |
|---|---|---|---|---|---|
| **All Programs** | | **Male** | **Female** | **Male** | **Female** |
| **Foreign Language:** | Mean | 1.360 | 1.633 | 0.856 | 1.135 |
| | SD | 1.567 | 1.685 | 1.390 | 1.480 |
| **Work:** | Mean | 15.930 | 11.362 | 11.975 | 7.964 |
| | SD | 12.184 | 10.770 | 12.558 | 10.686 |
| Correlation | | - .1900 | -0.0577 | - .0865 | -0.0071 |
| Slope (x $10^3$) | | -24.44 | - 9.03 | -9.57 | - 0.98 |
| **General Program** | | | | | |
| **Foreign Language:** | Mean | 0.821 | 0.915 | 0.551 | 0.720 |
| | SD | 1.345 | 1.310 | 1.113 | 1.230 |
| **Work:** | Mean | 16.967 | 11.277 | 12.196 | 7.475 |
| | SD | 12.462 | 11.170 | 12.926 | 10.787 |
| Correlation | | - .0815 | + .0392 | + .0118 | 0.0099 |
| Slope (x $10^3$) | | - 8.80 | + 4.60 | + 1.02 | 1.13 |
| **Academic Program** | | | | | |
| **Foreign Language:** | Mean | 2.149 | 2.581 | 2.057 | 2.343 |
| | SD | 1.504 | 1.608 | 1.612 | 1.453 |
| **Work:** | Mean | 13.406 | 10.281 | 9.921 | 7.180 |
| | SD | 11.314 | 10.014 | 11.231 | 9.669 |
| Correlation | | - .1289 | - .0313 | - .1280 | .0715 |
| Slope (x $10^3$) | | -17.14 | - 5.03 | -18.37 | +10.74 |

Appendix Table D.2 (continued)

| Vocational Program | | White Male | White Female | Black Male | Black Female |
|---|---|---|---|---|---|
| Foreign Language: | Mean | 0.299 | 0.662 | 0.254 | 0.550 |
| | SD | 0.846 | 1.152 | 0.785 | 1.100 |
| Work: | Mean | 19.949 | 13.465 | 13.879 | 10.221 |
| | SD | 12.284 | 11.324 | 12.873 | 11.554 |
| Correlation | | - .0060 | + .0365 | - .0535 | 0.0418 |
| Slope (x $10^3$) | | - 0.41 | + 3.71 | - 3.26 | 3.98 |

**Appendix Table D.3** Statistics for Regression Analyses of Vocabulary Test Scores on Hours of Academic and Vocational Instruction and Work, by Program, Race and Sex.

| | White | | Black | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| **General** | | | | |
| Mean Vocabulary | 5.517 | 5.326 | 2.236 | 2.259 |
| Constant | 4.367 | 4.203 | 1.453 | 1.130 |
| Coefficients | | | | |
| Hours - Academic | 0.0966 | 0.1000 | 0.0531 | 0.0674 |
| - Vocational | -0.1699 | -0.1884 | -0.1896 | -0.0243 |
| - Work | -0.0134 | 0.0027 | 0.0353 | -0.0720 |
| **Academic** | | | | |
| Mean Vocabulary | 8.545 | 9.029 | 5.231 | 4.958 |
| Constant | 8.686 | 8.436 | 6.130 | 5.894 |
| Coefficients | | | | |
| Hours - Academic | 0.0378 | 0.0686 | -0.0198 | - |
| - Vocational | -0.2413 | -0.3003 | -0.4778 | -0.2460 |
| - Work | -0.0440 | -0.0269 | -0.0119 | -0.0484 |
| **Vocational** | | | | |
| Mean Vocabulary | 4.682 | 5.279 | 2.269 | 2.704 |
| Constant | 4.372 | 4.948 | 3.151 | 1.170 |
| Coefficients | | | | |
| Hours - Academic | 0.0636 | 0.0636 | -0.0858 | -0.1000 |
| - Vocational | -0.0901 | -0.1417 | 0.0925 | -0.0606 |
| - Work | -0.0118 | 0.0085 | -0.0020 | 0.0178 |

**Appendix Table D.4** Percent of Individuals in Various Categories of Post-Secondary Training, by High School Program, Race, and Sex.

| Training Category | Program: | General | | | | Academic | | | | Vocational | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Race: | White | | Black | | White | | Black | | White | | Black | |
| | Sex: | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female |
| **No Training** | | 46.38 | 50.82 | 47.11 | 42.20 | 14.04 | 14.22 | 13.74 | 22.26 | 58.45 | 63.95 | 51.88 | 47.72 |
| **Less Than 2 Years** | | 27.33 | 30.28 | 32.72 | 38.55 | 19.69 | 21.14 | 28.10 | 20.79 | 21.21 | 24.09 | 26.45 | 32.81 |
| Vocational | | 10.71 | 15.24 | 16.34 | 20.96 | 4.42 | 6.68 | 6.36 | 8.85 | 11.99 | 16.91 | 18.55 | 18.89 |
| Academic | | 12.81 | 12.11 | 10.04 | 12.63 | 12.48 | 12.16 | 16.21 | 10.12 | 7.37 | 5.57 | 6.49 | 10.52 |
| Voc./Academic | | 3.81 | 2.93 | 6.34 | 4.96 | 2.79 | 2.30 | 5.53 | 1.82 | 2.35 | 1.61 | 1.41 | 3.40 |
| **2 Years or More** | | 26.30 | 18.90 | 20.18 | 19.26 | 66.26 | 64.63 | 58.15 | 56.95 | 19.83 | 11.96 | 21.67 | 19.46 |
| Vocational | | 4.83 | 1.47 | 1.81 | 1.59 | 2.72 | 2.83 | 2.24 | 2.22 | 10.64 | 4.57 | 10.96 | 3.35 |
| Academic | | 18.76 | 14.42 | 14.63 | 14.02 | 58.60 | 56.51 | 51.57 | 45.65 | 6.58 | 6.03 | 9.46 | 14.02 |
| Voc./Academic | | 2.71 | 3.01 | 3.74 | 3.65 | 4.94 | 5.29 | 4.34 | 9.08 | 2.61 | 1.36 | 1.25 | 2.09 |
| **Total Trained** | | 53.63 | 49.18 | 52.90 | 57.81 | 85.95 | 85.77 | 85.25 | 77.74 | 41.54 | 36.05 | 48.12 | 52.27 |
| Vocational | | 15.54 | 16.71 | 18.15 | 22.55 | 7.14 | 9.51 | 8.60 | 11.07 | 22.63 | 21.48 | 29.51 | 22.24 |
| Academic | | 31.57 | 26.53 | 24.67 | 26.65 | 71.08 | 68.67 | 66.78 | 55.77 | 13.95 | 11.60 | 15.95 | 24.54 |
| Voc./Academic | | 6.53 | 5.94 | 10.08 | 8.61 | 7.73 | 7.59 | 9.87 | 10.90 | 4.96 | 2.97 | 2.66 | 5.49 |

Appendix Table D.4 (Continued)

| | General | | Vocational | | Academic | |
|---|---|---|---|---|---|---|
| | White | Black | White | Black | White | Black |
| No Training | 48.37 | 44.40 | 14.13 | 18.81 | 61.50 | 49.49 |
| Less Than 2 Years | 28.66 | 35.94 | 20.39 | 23.75 | 23.03 | 30.10 |
| Vocational | 12.74 | 18.89 | 5.52 | 7.84 | 14.72 | 18.75 |
| Academic | 12.50 | 11.47 | 12.32 | 12.59 | 6.37 | 8.80 |
| Voc./Academic | 3.42 | 5.58 | 2.55 | 3.32 | 1.94 | 2.55 |
| 2 Years or More | 22.97 | 19.67 | 65.46 | 57.44 | 15.46 | 20.40 |
| Vocational | 3.32 | 1.69 | 2.77 | 2.23 | 7.27 | 6.59 |
| Academic | 16.81 | 14.29 | 57.58 | 48.05 | 6.27 | 12.08 |
| Voc./Academic | 2.84 | 3.69 | 5.11 | 7.16 | 1.92 | 1.73 |
| Total Trained | 51.63 | 55.61 | 85.85 | 81.19 | 38.49 | 50.50 |
| Vocational | 16.06 | 20.58 | 8.29 | 10.07 | 21.99 | 25.34 |
| Academic | 29.31 | 25.76 | 69.90 | 60.64 | 12.64 | 20.88 |
| Voc./Academic | 6.26 | 9.27 | 7.66 | 10.48 | 3.86 | 4.28 |

Appendix Table D.4 (Continued)

| | General | | Academic | | Vocational | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| No Training | 47.83 | 50.39 | 14.57 | 14.71 | 58.88 | 62.48 |
| Less Than 2 Years | 27.68 | 30.65 | 20.19 | 21.23 | 21.97 | 24.89 |
| Vocational | 11.28 | 15.74 | 4.74 | 6.78 | 12.55 | 16.69 |
| Academic | 12.30 | 11.55 | 12.63 | 12.19 | 7.34 | 6.49 |
| Voc./Academic | 4.10 | 3.36 | 2.82 | 2.26 | 2.08 | 1.71 |
| 2 Years or More | 24.50 | 18.97 | 62.23 | 64.05 | 19.14 | 12.63 |
| Vocational | 4.11 | 1.85 | 2.76 | 2.66 | 9.99 | 4.36 |
| Academic | 17.53 | 13.91 | 57.45 | 56.04 | 6.92 | 6.78 |
| Voc./Academic | 2.86 | 3.21 | 5.02 | 5.36 | 2.23 | 1.49 |
| Total Trained | 52.17 | 49.62 | 85.42 | 85.28 | 41.11 | 37.52 |
| Vocational | 15.38 | 17.59 | 7.50 | 9.43 | 22.54 | 21.05 |
| Academic | 29.83 | 25.46 | 70.08 | 68.23 | 14.26 | 13.27 |
| Voc./Academic | 6.96 | 6.57 | 7.84 | 7.62 | 4.31 | 3.20 |

# Appendix E:

## Definitions of High School Work Hours and College Entrance Requirements

Appendix Table E.1 Comments on the Coding of High School Work Categories.

Originally we intended to scale the high school work categories in the base year question (BQ8), using the cumulative distribution of responses. We planned to transform this distribution to produce a linear relation between the values at the category boundries and the cumulative proportion corresponding to it. We then planned to interpolate to the value corresponding to the category median. After several tries at this approach it became apparent that all the resulting values were so close to the category midpoint that this was a reasonable value.

| Label | File Code | Hours Recode |
|---|---|---|
| None | 0 | 0 |
| Less than 6 hours | 1 | 3 |
| 6 to 10 hours | 2 | 8.5 |
| 11 to 15 hours | 3 | 13.5 |
| 16 to 20 hours | 4 | 18.5 |
| 21 to 25 hours | 5 | 23.5 |
| 26 to 30 hours | 6 | 28 |
| More than 30 hours | 7 | 35 |

Appendix Table E.2 Definition of College Entrance Requirements.

| | Number of Semesters Required for Admission | | |
|---|---|---|---|
| Subject Area | Purdue | Northern Michigan | Harvard |
| English | 6 | 6 | 6 |
| Mathematics | 4 | 6 | 6 |
| Science | 2 | 4 | 2 |
| Social Studies | 2 | 0* | 2 |
| Foreign Language | 0 | 0 | 6 |

*All pupils satisfying Northern Michigan University's other course requirements for admission also completed at least two semesters of social studies. Therefore, the requirements for Purdue and Northern Michigan segment pupils into three completely ordered categories. However, there are some pupils who will satisfy Harvard's course entry requirements who will not satisfy North Michigan's, because of the descrepancy in science requirements.

# Contractor Report

## Accuracy of Estimates Reported in High School Learning, Vocational Tracking, and What Then?

National Center for
Education Statistics

**Accuracy of Estimates**
**Reported in High School Learning,**
**Vocational Tracking, and What Then?**

David E. Wiley
Northwestern University

Andrew J. Kolstad
Project Officer
National Center for Education Statistics

July 1980

Prepared for the National Center for Education Statistics under contract OE-0-73-6666 with the U.S. Department of Education. Contractors undertaking such projects are encouraged to express freely their professional judgment. This report, therefore, does not necessarily represent positions on policies of the Government, and no official endorsement should be inferred. This report is released as received from the contractor.

NCES 82-214

## 1. Introduction

The purpose of this paper is to provide the necessary information to approximate the accuracy -- in terms of standard errors -- of estimates reported in High School Learning, Vocational Tracking, And What Then? (Wiley and Harnischfeger, 1980).

The data analyzed in this report were collected as a part of a major national longitudinal study of high school seniors: the National Longitudinal Study of the High School Class of 1972. This study was initiated and carried out by the National Center for Education Statistics, U.S. Department of Health, Education, and Welfare. The study was conceived as a survey of a representative, national sample of high school seniors and their schools, using questionnaires which were completed by the seniors at their schools during Spring 1972, and simultaneously by school officials. Questions directed at the pupils focussed on their backgrounds, experiences, attitudes and plans; ability tests were also administered to them. Questions directed at school officials were attempts at characterizing the school's programs and facilities and also information from the school's records about the individual pupils who were tested and responded to the questionnaires.

The population which the study attempted to sample was all twelfth graders enrolled during 1972 in all public and private schools in the 50 states and the District of Columbia. The initial sample survey has been followed up by four additional surveys of the originally sampled individuals and of a specially selected supplemental sample designed to compensate for defects found in the original sampling frame and in the implementation of the original survey. The primary sample originally consisted of 1,200 schools and was targeted to a maximum of 18 pupils per school. In actuality, 1,044 schools and 17,726 pupils participated of whom 16,683 completed the questionnaire. The supplementary sample consisted of 257 additional schools and 4,450 additional pupils. First follow up (October 1973) questionnaires were sent to 23,654 individuals and were completed by 21,350. The second (October, 1974) and third follow-up (October, 1976) questionnaires were completed by 20,872 and 20,194 individuals respectively. These questionnairs focussed on the living conditions, work experiences, education and training, military service, family status, life experiences and opinions of these individuals. The data reported in this document were collected in the base year and the first three follow-ups. The fourth follow-up survey had not been completed when this study was initiated.

In the summer of 1978 a request for proposal was issued by the National Center for Education Statistics inviting proposals to analyze the data base which existed at that time. One of the areas in which the solicited analyses was: Effects of Vocational Schooling on Labor Market Outcomes. On August 17, 1978, the ML-Group for Policy Studies in Education, CEMREL, Inc., submitted a proposal for such analyses and reporting and a contract to pursue them was awarded on September 30, 1978. The report referred to above was one of the outcomes of that project.

## 2. Context for the Assessment of Accuracy

The report utilized a post-survey stratification of the sample based on the sex (male, female), race (white non-Hispanic, black, others) and high school program (academic, general, vocational), and all analyses were conducted using sample weights maximizing the number of cases having core base year data and responses to all three followups (W17, see Levinsohn, *et al.*, 1978).

As all basic comparisons involved the race, sex, or high school program of survey respondents, the actual sample sizes for categories based on these factors are required for accuracy assessments. These frequencies are given in Table 1.

## 3. The Conceptual Framework for Accuracy Assessment

All modern surveys are, at their base, probability samples from defined populations. They are also, because of cost and accuracy considerations, based on stratification and clustering of the population. These latter factors affect the accuracy of the resulting estimates.

If simple random sampling were done without replacement from a dichotomous population, the appropriate probability distribution of estimating a population proportion would take the hypergeometric form:

$$P(X=k) = \frac{\binom{N - \pi N}{k}\binom{\pi N}{n-k}}{\binom{N}{n}}$$

where N is the population size, n the sample size, $\pi$ the true proportion of the population having a certain characteristic , and k the number in the sample having the characteristic. The estimator of the proportion having the characteristic, $\hat{\pi}$ ,

Table 1. Base Sample Sizes[*] for Post-Survey Strata: Race by Sex by High School Program

| Sex/High School Program | Race | | | |
|---|---|---|---|---|
| **Male** | White | Black | Other | Total |
| Academic | 2150 | 500 | 330 | 2980 |
| General | 3200 | 260 | 270 | 3730 |
| Vocational | 2140 | 280 | 220 | 2640 |
| Total Male | 7490 | 1040 | 820 | 9350 |
| **Female** | | | | |
| Academic | 1780 | 550 | 340 | 2670 |
| General | 3030 | 370 | 240 | 3640 |
| Vocational | 1820 | 390 | 120 | 2330 |
| Total Female | 6630 | 1310 | 700 | 8640 |
| **Both Sexes** | | | | |
| Academic | 3930 | 1050 | 670 | 5650 |
| General | 6230 | 630 | 510 | 7370 |
| Vocational | 3960 | 670 | 330 | 4970 |
| Total | 14120 | 2350 | 1520 | 17990 |

---

[*] These base frequencies were computed as relating to calculations performed using the sampling weight labeled W17 in Levinsohn, et al.,1978. They are not the exact values for which data were available and used for specific estimates as these varied, but represent a base figure for standard error estimation.

may be computed from the sample by dividing k by the sample size n. The variance of the estimated proportion is

$$\mathrm{Var}(\hat{\pi}) = (1 - \frac{n}{N})\left[\left(\frac{N}{N-1}\right)\frac{\pi(1-\pi)}{n}\right]$$

Ignoring the finite population correction factor, $(1- \frac{n}{N})$, the standard error (the square root of the variance) is inversely proportional to the square root of the sample size (n). The finite population correction factor becomes important when the base population is small. Stratified and clustered samples may proportionally increase or decrease precision from this random sampling base level, but, for a particular sampling design, this basic relation between sample size and precision does not vary.

The probability sample used by the National Longitudinal Study is not simply random, since it involves clustering and stratification. Stratification of the sample is done to ensure that certain subgroups of the total population will be adequately represented in the sample so as to allow accurate reporting of results for these subgroups. Breaking the total population down into subgroups and drawing samples from the subgroups allows more precise estimation for the subgroups than would be possible by using a simple random sample of equal size. Depending on how these subgroups are chosen, the stratification involved may either increase or decrease precision in the estimation of national proportions. Typically, stratification is used to increase precision, but it may also be used to allow controlled estimation for subpopulations. Clustering on the other hand is generally done to reduce sampling cost. The savings from using clustering in a sample design (e.g., due to lower traveling cost) can be quite dramatic, but clustering also results in lower precision than would be obtained in a random sample.

The ratio of the precision of the actual sample used to precision of a simple random sample is called the design effect and may be written as

$$\text{Design Effect} = \frac{(\text{SE})^2 \text{ actual sample}}{(\text{SE})^2 \text{ random sample}}$$

where SE is the standard error of the estimate. Even though the standard errors of estimated proportions from a stratified and clustered sample or from a random sample may each vary, they tend to vary in a systematic way to one another. This results in the design effect remaining relatively constant for different estimates using the same survey sample design.

Knowledge of the magnitude of the design effect indicates how sample size must be varied from the random sample size required to attain a given level of precision. For example, if the design effect is 2, then, under ordinary cicumstances, a sample twice as large as that of a simple random sample is required to attain an equal level of precision.

Thus, three key facts are necessary if we are to approximate the standard error of a specific estimate

- -- the actual sample size (n),
- -- the sampling variance of the characteristic when a simple random sample is drawn, ($\sigma^2$), and
- -- the design effect (D).

When these factors are known, the standard error is simply

$$SE = \sqrt{\frac{D\sigma^2}{n}}$$

## 3.1 Sample Size

As mentioned above, the relevant base sample sizes for particular estimates are given in Table 1. These are relevant for all base year statistics given in the report. In addition, some estimates concern test scores. The number of individuals having test score data is about 75 percent (Table 2) of the totals in Table 1. Also in Chapter 4 of the report, data are presented for subgroups based on post-secondary educational experiences and work patterns. The percentage decomposition of the base groups (Table 1) into these subcategories are given, respectively, in Appendix Table D.4 and Table 4.18 of the report.

Table 2. Adjustment Factors for Standard Error Calculations

| | |
|---|---|
| 1. Estimated Design Effect | 1.42 |
| 2. Sample Size reduction for those with ability test scores | 75% |
| 3. Standard Deviation Components for Selected Continuous Variables | |
| Hours of High School Instruction/Week | |
| Vocational | 3.0 |
| Academic | 6.4 |
| Total | 6.0 |
| Hours of High School Work/Week | 11.3 |
| Test Scores | |
| Vocabulary | 3.6 |
| Reading | 4.3 |
| Mathematics | 5.8 |
| 1978 Work Characteristics | |
| Hours/Week | 10.4 |
| Wage Rate | 80.5 |

### 3.2 Design Effect

The average design effect, as implicitly reported in the "Capsule Descriptions" of the base year and followup surveys ranged from below 1.00 to 1.50, depending on the survey. The average value for the third followup (Eckland and Wisenbaker, 1979; Appendix Table A-1) was about 1.42. As the sample weights explicitly incorporate the third followup and as the most thorough assessment of design effect has been incorporated into those assessments, I have use this value (Table 2).

### 3.3 Variance Component Factors

Within-cell variances do not differ greatly over the cells reported in Table 1. They also are only slightly reduced as additional strata are added. Thus, we have taken typical (average) values of the weighted within-cell variances for particular scaled variables as a base factor in computing standard errors for these characteristics. These are given in standard deviation form for important characteristics in Table 2. The standard deviations, under random sampling, of categorical percentages (dichotomies) can be directly estimated from the estimated proportion itself, i.e., the "sampling variance" of a single observation equals $p(1 - p)$, the binomial error factor.

## 4. Examples

### 4.1 Table 3.8 (Page 35)

Mean hours per week of vocational instruction in high school are 2.68 and 3.63 for white males and females, respectively. The estimated standard error of the first estimate is

$$\sqrt{\frac{(1.42)(3.0)}{7490}} = 0.024 \text{ , where}$$

1.42 is the design effect (Table 2), 3.0 is the sampling variance (Table 2), and 7490 (Table 1) is the sample size. The corresponding standard error for females is

$$\sqrt{\frac{(1.42)(3.0)}{6630}} = 0.025 \text{ .}$$

If we wish to assess the difference in course exposure, 0.95 = 3.63 - 2.68 , then we can assess its standard error* as

$$\sqrt{(.024)^2+(.025)^2} = .035 \text{ .}$$

Thus, the difference is 27 times its standard error.

---

*As the covariance between the estimates is slightly positive, this is a slight overestimate.

4.2 Table 4.9 (Page 98)

75.44 percent of white male vocational track pupils worked in the fall of 1972 while only 47.09 percent of academic track pupils did so. The estimated standard error for these vocational pupils is

$$100\sqrt{\frac{(1.42)(0.185)}{2140}} = 1.109$$

where 1.42 is the design effect (Table 2), 0.185 is the binomial error factor (sampling variance), i.e., it equals

$$\left(\frac{75.44}{100}\right)\left(\frac{100 - 75.44}{100}\right),$$

2140 is the sample size (Table 1) and 100 converts the standard error from a proportion metric to a percentage one.

The standard error for white males in the academic track is

$$100\sqrt{\frac{(1.42)(.249)}{2150}} = 1.283 .$$

The standard error of the difference is $\sqrt{(1.283)^2+(1.109)^2} = 1.696$ . Thus, the difference, 28.35, is over 16 times its standard error.

## References

Eckland, B. K. and Wisenbaker, J. M. National Longitudinal Study: A Capsule Description of Young Adults Four and One-half Years After High School. Research Triangle Park, N.C.: RTI, 1979.

Wiley, D. E. and Harnischfeger, A. High School Learning, Vocational Tracking, And What Then? Evanston, Ill.: ML-GROUP, 1980.

Levinsohn, J.R., Henderson, L.B., Riccobono, J.A., and Moore, R.P., National Longitudinal Study Base Year, First, Second and Third Follow-up DATA FILE USERS MANUAL. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, 1978.